



FAKULTI SAINS

Maklumat Am

Fakulti Sains mula ditubuhkan sebagai Bahagian Sains Asas pada tahun 1972, dan telah melalui beberapa proses penstrukturan dan sekarang ini Fakulti Sains terdiri daripada empat jabatan iaitu: Jabatan Biologi, Jabatan Kimia, Jabatan Matematik dan Jabatan Fizik. Visi Fakulti adalah selaras dengan objektif UPM, iaitu untuk menjadi pusat pendidikan, penyelidikan dan pengembangan dalam bidang sains yang terbilang.

Sebagai sebuah fakulti dalam sebuah universiti penyelidikan, Fakulti Sains bersedia membentuk dan mencorak pelajar supaya menjadi graduan sains yang berfikir kritis dan kreatif dan bersedia untuk menghadapi pasaran kerja, atau melanjutkan pengajian ke peringkat siswazah. Program prasiswazah dibentuk untuk memberikan asas yang kukuh dalam bidang teras dan untuk membentuk perspektif sains. Ilmu dan kepakaran disampaikan kepada pelajar oleh pegawai akademik yang cukup terlatih dan berpengalaman, menggunakan kaedah pengajaran dan pembelajaran yang bersesuaian dan berkesan serta disokong oleh kemudahan yang terkini.

Kualiti pensyarah dan penyelidikan yang dijalankan di Fakulti Sains mendapat pengiktirafan di peringkat kebangsaan dan antarabangsa. Setiap tahun pegawai akademik menerbitkan beratus artikel penyelidikan dalam jurnal dan memenangi banyak anugerah penyelidikan. Fakulti juga adalah di antara penerima geran penyelidikan yang terbesar di UPM dan sentiasa berusaha untuk memperbaiki rekod yang telah dicapai. Fakulti Sains juga merupakan salah sebuah fakulti yang bertaraf lima bintang melalui penarafan MyRA, Kementerian Pengajian Tinggi.

FACULTY OF SCIENCE

General Information

The Faculty of Science was initially established as the Division of Basic Sciences in 1972 which subsequently underwent several restructuring processes. Presently the Faculty of Science consists of four departments, the Department of Biology, Department of Chemistry, Department of Mathematics and Department of Physics. The Vision of the Faculty, consistent with one of the University objectives, is to be a renowned center of education, research and development in the field of science.

As a faculty in a research university, the Faculty of Science is well equipped to mould and transform students into critical and creative-minded science graduates who are ready for the job market or to continue their studies at the post-graduate level. The Undergraduate programs at the Faculty are designed to provide a strong foundation in core areas and to develop scientific perspectives. Knowledge and expertise are imparted to the students by the well trained and experienced academic staff, using appropriate and effective teaching and learning techniques supported by up to date facilities.

The quality of the lecturers and the research carried out at the Faculty of Science has received recognition at national and international levels. Each year, the Faculty's academic staff members publish hundreds of research articles in journals and win many research awards. The Faculty which is also one of the largest recipients of research grants in UPM, continuously strives to improve on its excellent past records. The Science Faculty is also one of the faculties which achieved five star rating in the Ministry of Higher Education's MyRA assessment.





Pengurusan Fakulti

Dekan/Dean

Prof. Dr. Zainal Abidin Talib

Timbalan Dekan (Akademik, Hal Ehwal Pelajar dan Alumni)

Deputy Dean (Academic Student Affairs and Alumni)

Dr. Nor Azowa Ibrahim

Timbalan Dekan (Penyelidikan dan Pengajian Siswazah)

Deputy Dean (Graduate and Research)

Prof. Madya Dr. Abdul Halim Abdullah

Timbalan Dekan (Pembangunan dan Kewangan)

Deputy Dean (Development and Finance)

Prof. Dr. Habshah Midi

Ketua Jabatan Biologi

Head, Department of Biology

Prof. Dr. Ahmad Ismail

Ketua Jabatan Fizik

Head, Department of Physics

Prof. Madya Dr. Zaidan Abdul Wahab

Ketua Jabatan Kimia

Head, Department of Chemistry

Prof. Madya Dr. Irmawati Ramli

Ketua Jabatan Matematik

Head, Department of Mathematics

Prof. Madya Dr. Nik Mohd Asri Nik Long

Ketua Penolong Pendaftar

Chief Assistant Registrar

Puan Fairuz Bawaze'er Muchtar





Program Prasiswazah yang ditawarkan

Bachelor

1. Bachelor Sains (Kep.)/ *Bachelor of Science (Honours)*
 - Major Biologi/ *Major in Biology*
 - Major Kimia/ *Major in Chemistry*
 - Major Kimia Petroleum/ *Major in Petroleum Chemistry*
 - Major Kimia Perindustrian/ *Major in Industrial Chemistry*
 - Major Fizik/ *Major in Physics*
 - Major Sains Instrumentasi/ *Major in Instrumentation Science*
 - Major Sains Bahan/ *Major in Material Science*
 - Major Matematik/ *Major in Mathematics*
 - Major Statistik/ *Major in Statistics*
2. Bachelor Sains Dengan Pendidikan (Kep.)/ *Bachelor of Science With Education (Honours)*
 - Major Fizik/ *Major in Physics*
 - Major Kimia/ *Major in Chemistry*
 - Major Biologi/ *Major in Biology*
 - Major Matematik/ *Major in Mathematics*





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains (Kepujian) Major Biologi/**
Bachelor of Science (Honours) Major in Biology

Jumlah Kredit Bergraduat : **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4Tahun/Years)**

1. Kursus Universiti/ University Courses (18 Kredit / credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam Dan Tamadun Asia/ <i>Islamic Civilization And Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ Core Courses (67 kredit/ credits)

i. Asas/ Basic (29 kredit/ Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3100	Biologi Mikroorganisma/ <i>Biology of Microorganisms</i>	3	2	1
PHY2001	Fizik Am*/ <i>General Physics*</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0





ii. Major/ Major (38 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1
BGY3201	Struktur dan Fungsi Tumbuhan/ <i>Plant Structure and Function</i>	3	2	1
BGY3202	Struktur dan Fungsi Haiwan/ <i>Animal Structure and Function</i>	3	2	1
BGY3701	Biostatistik/ <i>Biostatistics</i>	3	2	1
BGY3301	Fisiologi Tumbuhan/ <i>Plant Physiology</i>	4	3	1
BGY3302	Fisiologi Haiwan/ <i>Animal Physiology</i>	4	3	1
BGY3401	Ekologi/ <i>Ecology</i>	3	2	1
BGY3501	Genetik/ <i>Genetics</i>	4	3	1
BGY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (35 kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya 20 kredit daripada kursus dalam senarai Elektif Jabatan, 6 kredit daripada kursus Elektif Sains Komputer dan Teknologi Maklumat dan 9 kredit daripada Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan keperluan 35 kredit kursus elektif./ *Student must choose at least 20 credits of courses listed in the departmental electives, 6 credits from Computer Science And Information Technology courses and 9 credits listed in the general electives or equivalent courses approved by the department to complete the 35 credits of elective courses.*

i. Elektif Jabatan/ *Department Electives* (20 Kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY4101	Mikologi/ <i>Mycology</i>	4	3	1
BGY4102	Kimotaksonomi Tumbuhan/ <i>Plant Chemotaxonomy</i>	4	3	1
BGY4105	Fikologi/ <i>Phycology</i>	3	2	1
BGY4106	Biologi Organisma Akuatik Komersil/ <i>Biology of Commercial Aquatic Organisms</i>	4	3	1
BGY4107	Biologi dan Propagasi Alga Komersil/ <i>Biology and Propagation of Commercial Algae</i>	4	3	1
BGY4108	Parasitologi dan Entomologi Kesihatan/ <i>Parasitology and Entomology in Health</i>	4	3	1





BGY4109	Biosistematik dan Pemuliharaan Tumbuhan Berbiji/ <i>Biosystematic and Conservation of Seed Plants</i>	4	3	1
BGY4503	Biologi Pembiakan Bandingan/ <i>Comparative Reproductive Biology</i>	4	3	1
BGY4302	Fisiologi Persekitaran (Tumbuhan)/ <i>Environmental Physiology (Plant)</i>	3	2	1
BGY4401	Ekologi Hutan Tropika/ <i>Tropical Forest Ecology</i>	4	3	1
BGY4402	Ekologi Hidupan Liar/ <i>Wildlife Ecology</i>	4	3	1
BGY4403	Ekotoksikologi/ <i>Ecotoxicology</i>	4	3	1
BGY4404	Limnologi dan Oseanografi/ <i>Limnology and Oceanography</i>	4	3	1
BGY4406	Biologi dan Ekologi Rumput Laut/ <i>Biology and Ecology of Seagrasses</i>	4	3	1
BGY4407	Pengurusan Ekosistem Akuatik/ <i>Aquatic Ecosystem Management</i>	4	4	0
BGY4408	Limnologi Gunaan/ <i>Applied Limnology</i>	4	3	1
BGY4501	Polimorfisme Genetik/ <i>Genetic Polymorphisms</i>	4	3	1
BGY4504	Genetik Populasi/ <i>Population Genetics</i>	4	3	1
BGY4505	Genetik Kuantitatif/ <i>Quantitative Genetics</i>	4	3	1
BGY4502	Genetik dan Pembiakbakaan Organisma Akuatik/ <i>Genetics and Breeding of Aquatic Organisms</i>	4	3	1
BGY4801	Teknik Pengasingan dan Penulenan Dalam Analisis Protein/ <i>Separation and Purification Techniques in Protein Analysis</i>	3	2	1
BGY4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4

ii. Elektif Sains Komputer Dan Teknologi Maklumat/ *Computer Science and
Information Technology Electives (6 Kredit/ credits)*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A
SSK3002	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1





iii. Elektif Umum/ *General Electives* (9 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	3	0
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	3	0
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
FEM3301	Etika Dan Nilai Dalam Pembangunan/ <i>Ethics And Values In Development</i>	3	3	0
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota /Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory* for students to take **2 credits of co-curriculum courses** offered by the university
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3100	Biologi Mikroorganisma/ <i>Biology of Microorganisms</i>	3	2	1
PRT2008	Pertanian Dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
JUMLAH/ TOTAL		14	12	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
BGY3701	Biostatistik/ <i>Biostatistics</i>	3	2	1
JUMLAH/ TOTAL		15	12	3

*Pelajar disaran agar mendaftar satu kursus ko-kurikulum berkredit pada Semester 2 / *Students are adviced to register a co-curriculum course in Semester 2.*

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BBI2424	<i>Academic Writing</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1





BGY3201	Struktur dan Fungsi Tumbuhan/ <i>Plant Structure and Function</i>	3	2	1
BGY3401	Ekologi/ <i>Ecology</i>	3	2	1
JUMLAH/ TOTAL		17	12	5

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3202	Struktur dan Fungsi Haiwan/ <i>Animal Structure and Function</i>	3	2	1
BGY3301	Fisiologi Tumbuhan/ <i>Plant Physiology</i>	4	3	1
BGY3501	Genetik/ <i>Genetics</i>	4	3	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
JUMLAH/ TOTAL		15	11	4

*Pelajar disarankan agar mendaftar satu kursus ko-kurikulum berkredit pada Semester 4 / *Students are advised to register a co-curriculum course in Semester 4.*

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3302	Fisiologi Haiwan/ <i>Animal Physiology</i>	4	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
	Elektif/ <i>Elective</i>	4		
JUMLAH/ TOTAL		15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY2001	Fizik Am*/ <i>General Physics*</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
	Elektif/ <i>Elective</i>	8		
JUMLAH/ TOTAL		15		





TAHUN 4/ 4TH YEAR/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Elective</i>	12		
	JUMLAH/ TOTAL	15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Elective</i>	11		
	JUMLAH/ TOTAL	14		



STRUKTUR KURIKULUM/ CURRICULUM OUTLINE

Nama Program : **Bachelor Sains (Kepujian) Major Fizik/**
Bachelor of Science (Honours) Major in Physics

: **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ University Courses (18 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PRT2008	Pertanian Dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ Core Courses (69 kredit/ credits)

i. Asas/ Basic Courses (33 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
atau/ or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1



BGY2001	Konsep Biologi* / <i>Biological Concept</i>	4	3	1
atau/ or				
CHM2000	Kimia Am* / <i>General Chemistry*</i>	4	3	1

Nota: Pelajar lulusan Matrikulasi dan STPM tanpa subjek biologi dikehendaki mengambil BGY 2001 manakala pelajar lulusan Matrikulasi dan STPM tanpa subjek kimia dikehendaki mengambil CHM 2000/ *Students who have completed Matriculation and STPM without Biology are required to take BGY2001 while those without Chemistry are required to take CHM2000.*

ii. Major/ *Major* (36 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3201	Fizik Keadaan Pepejal/ <i>Solid State Physics</i>	3	3	0
PHY3301	Elektronik Analog/ <i>Analog Electronics</i>	3	2	1
PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
PHY3602	Mekanik Statistik/ <i>Statistical Mechanics</i>	3	3	0
PHY3603	Mekanik Klasik/ <i>Classical Mechanics</i>	3	3	0
PHY3604	Kaedah Matematik dalam Fizik/ <i>Mathematical Methods in Physics</i>	3	3	0
PHY4504	Fizik Nuklear/ <i>Nuclear Physics</i>	3	3	0
PHY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (33 Kredit/ *credits*)

Pelajar mesti memilih sekurang-kurangnya 27 kredit daripada kursus dalam senarai Elektif Jabatan, 6 kredit daripada kursus Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 33 kredit kursus elektif/ *Students must choose at least 27 credits listed in the departmental electives courses, 6 credits listed in the general electives or equivalent courses approved by the department to complete the 33 credits of elective courses.*

i. Elektif Jabatan/ *Departmental Electives* (27 kredit/ *credits*)

Pelajar mesti memilih sekurang-kurangnya satu kursus dengan amali daripada senarai di bawah/ *Students must take at least one course with laboratory as listed below.*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3103	Analisis Vektor/ <i>Vector Analysis</i>	3	3	0
MTH3302	Analisis Kompleks/ <i>Complex Analysis</i>	3	3	0



PHY3305	Instrumentasi Pengenalan/ <i>Introductory Instrumentation</i>	3	3	0
PHY4201	Fizik Keadaan Pepejal Lanjutan/ <i>Advanced Solid State Physics</i>	3	3	0
PHY4202	Peranti Semikonduktor/ <i>Semiconductor Devices</i>	3	3	0
PHY4203	Sains Bahan/ <i>Materials Science</i>	3	3	0
PHY4301	Mikroprosesor & Mikrokomputer/ <i>Microprocessor and microcomputer</i>	3	3	0
PHY4401	Keelektromagnetan Gunaan/ <i>Applied Electromagnetism</i>	3	3	0
PHY4402	Optik Moden/ <i>Modern Optics</i>	3	3	0
PHY4502	Fizik Sinaran dan Radiobiologi/ <i>Radiation Physics and Radiobiology</i>	3	3	0
PHY4503	Kerelatifan Khas dan Teori Medan Klasik/ <i>Special Relativity & Classical Field Theory</i>	3	3	0
PHY4601	Fizik Matematik/ <i>Mathematical Physics</i>	3	3	0
PHY4602	Fizik Pengkomputeran/ <i>Computational Physics</i>	4	3	1
PHY4603	Mekanik Kuantum Lanjutan/ <i>Advanced Quantum Mechanics</i>	3	3	0
PHY4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4
PHY4902	Kursus Khas/ <i>Special Topics</i>	3	3	0
PHY4995	Amali Lanjutan/ <i>Advanced Practicals</i>	3	0	3

ii. Elektif Umum/ *General Elective* (6 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles Of Economics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial



Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory for students to take 2 credits of co-curriculum courses offered by the university*
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points



SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau/ or				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
JUMLAH/ TOTAL		15	13	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
JUMLAH/ TOTAL		15	13	2

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3604	Kaedah Matematik dalam Fizik/ <i>Mathematical Methods in Physics</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
JUMLAH/ TOTAL		16	14	2



SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3201	Fizik Keadaan Pepejal/ <i>Solid State Physics</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
CHM 3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
JUMLAH/ TOTAL		16	14	2

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3602	Mekanik Statistik/ <i>Statistical Mechanics</i>	3	3	0
PHY3603	Mekanik Klasik/ <i>Classical Mechanics</i>	3	3	0
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau/or				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
	Elektif Umum/ <i>General Electives</i>	3		
JUMLAH/ TOTAL		16		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3302	Elektronik Analog	3	2	1
PHY4504	Fizik Nuklear/ <i>Nuclear Physics</i>	3	3	0
	Elektif Jabatan/ <i>Departmental Electives</i>	6		
	Elektif Umum/ <i>General Electives</i>	3		
JUMLAH/ TOTAL		15		

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3





Elektif Jabatan/ <i>Departmental Electives</i>	12
JUMLAH/ TOTAL	15

SEMESTER 2/2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif Jabatan/ <i>Departmental Electives</i>	9		
	JUMLAH/ TOTAL	12		





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains (Kepujian) Major Sains Bahan/
Bachelor of Science (Honours)/ Major in Materials Science**

Jumlah Kredit Bergraduat : **120 Jam Kredit/ Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4Tahun/ Years)**

1. Kursus Universiti/ University Courses (18 Kredit/ Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PRT2008	Pertanian Dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam Dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ Core Courses (69 Kredit/ credits)

i. Asas/ Basic (30 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau/or				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau/or				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1





Nota: Pelajar lulusan Matrikulasi dan STPM tanpa subjek biologi dikehendaki mengambil BGY 2001 manakala pelajar lulusan Matrikulasi dan STPM tanpa subjek kimia dikehendaki mengambil CHM 2000./ *Students who have completed Matriculation and STPM without biology are required to take BGY2001 and those without chemistry are required to take CHM2000.*

ii. Major/ Major (39 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
PHY3208	Kemagnetan dan Bahan Magnet/ <i>Magnetism and Magnetic Materials</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
PHY4203	Sains Bahan/ <i>Materials Science</i>	3	3	0
PHY4204	Kaedah Analisis Struktur dan Mikrostruktur/ <i>Analytical Methods of Structure and Microstructure</i>	4	3	1
PHY4205	Seramik dan Polimer/ <i>Ceramics and Polymer</i>	4	3	1
PHY4206	Logam dan Alooi/ <i>Metals and Alloys</i>	4	3	1
PHY4207	Teknologi Pemprosesan Bahan/ <i>Materials Processing Technology</i>	3	3	0
PHY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (33 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya 27 kredit daripada kursus dalam senarai Elektif Jabatan, 6 kredit daripada kursus Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 33 kredit kursus elektif./ *Students must choose at least 27 credits listed in the departmental electives courses, 6 credits listed in the general electives or equivalent courses approved by the department to complete the 33 credits of elective courses.*

i. Elektif Jabatan/ *Department Elective* (27 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya satu kursus dengan amali daripada senarai di bawah/ *Students must take at least one course with laboratory as listed below*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
PHY3305	Instrumentasi Pengenalan/ <i>Introductory Instrumentation</i>	3	3	0
PHY3602	Mekanik Statistik/ <i>Statistical Mechanics</i>	3	3	0
PHY3603	Mekanik Klasik/ <i>Classical Mechanics</i>	3	3	0





PHY3604	Kaedah Matematik dalam Fizik/ <i>Mathematical Methods in Physics</i>	3	3	0
PHY4201	Fizik Keadaan Pepejal Lanjutan/ <i>Advanced Solid State Physics</i>	3	3	0
PHY4202	Peranti Semikonduktor/ <i>Semiconductor Devices</i>	3	3	0
PHY4402	Optik Moden/ <i>Modern Optics</i>	3	3	0
PHY4502	Fizik Sinaran dan Radiobiologi/ <i>Radiation Physics and Radiobiology</i>	3	3	0
PHY4504	Fizik Nuklear/ <i>Nuclear Physics</i>	3	3	0
PHY4602	Fizik Pengkomputeran/ <i>Computational Physics</i>	4	3	1
PHY4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4
PHY4995	Amali Lanjutan/ <i>Advanced Practicals</i>	3	0	3

ii. Elektif Umum/ *General Elective* (6 Kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory for students to take 2 credits of co-curriculum courses offered by the university*
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points



SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau/or				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
JUMLAH/ TOTAL		15	13	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
JUMLAH/ TOTAL		15	13	2

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3201	Fizik Keadaan Pepejal/ <i>Solid State Physics</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
JUMLAH/ TOTAL		16	14	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3208	Kemagnetan dan Bahan Magnet/ <i>Magnetism and Magnetic Materials</i>	3	3	0
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
PHY4203	Sains Bahan/ <i>Materials Science</i>	3	3	0
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
JUMLAH/ TOTAL		16	14	2

TAHUN 3/ 3RD YEARSEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4204	Kaedah Analisis Struktur dan Mikrostruktur/ <i>Analytical Methods of Structure and Microstructure</i>	4	3	1
PHY4206	Logam dan Aloil/ <i>Metals and Alloys</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau/ or				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
	Elektif Umum/ <i>General Electives</i>	3		
JUMLAH/ TOTAL		15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4205	Seramik dan Polimer/ <i>Ceramics and Polymer</i>	4	3	1
PHY4207	Teknologi Pemprosesan Bahan/ <i>Materials Processing Technology</i>	3	3	0
	Elektif Jabatan/ <i>Departmental Electives</i>	6		
	Elektif Umum/ <i>General Electives</i>	3		
JUMLAH/ TOTAL		16		





TAHUN 4/4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif Jabatan/ <i>Departmental Electives</i>	12		
	JUMLAH/ TOTAL	15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif Jabatan/ <i>Departmental Electives</i>	9		
	JUMLAH/ TOTAL	12		





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program	:	Bachelor Sains (Kepujian) Major Sains Instrumentasi/ <i>Bachelor of Science (Honours) Major in Instrumentation Science</i>
Jumlah Kredit Bergraduat	:	122 Jam Kredit / <i>Credit Hours</i>
Tempoh Pengajian	:	8 Semester/ <i>Semesters</i> (4 Tahun/ <i>Years</i>)

1. Kursus Universiti/ *University Courses* (18 Kredit/ *credits*)

KOD KURSUS/ <i>COURSE CODE</i>	NAMA KURSUS/ <i>COURSE NAME</i>	Kr	K	A/T
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ *Core Courses* (70 Kredit/ *credits*)

i. Asas/ *basic* (30 kredit/ *credits*)

KOD KURSUS/ <i>COURSE CODE</i>	NAMA KURSUS/ <i>COURSE NAME</i>	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau/ or				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
BGY2001	Konsep Biologi* / <i>Biological Concepts*</i>	4	3	1
atau/ or				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1





Nota : * Pelajar lulusan Matrikulasi dan STPM tanpa subjek Biologi dikehendaki mengambil BGY2001 manakala pelajar lulusan Matrikulasi dan STPM tanpa subjek Kimia dikehendaki mengambil CHM2000/ *Students who have completed Matriculation and STPM without biology are required to take BGY2001 and those who completed without chemistry are required to take CHM2000.*

ii. Major/ Major (40 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3301	Elektronik Analog/ <i>Analog Electronics</i>	3	2	1
PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3303	Sensor dan Transduser/ <i>Sensors and Transducers</i>	4	3	1
PHY3304	Prinsip Sistem Pengukuran/ <i>Principle of Measurement System</i>	4	3	1
PHY3305	Instrumentasi Pengenalan/ <i>Introductory Instrumentation</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY4301	Mikroprosesor & Mikrokomputer/ <i>Microprocessor and microcomputer</i>	3	3	0
PHY4302	Rekabentuk Peralatan Elektronik/ <i>Design of Electronic Equipment</i>	4	3	1
PHY4303	Pengantaramuka Komputer dan Kawalan/ <i>Computer Interfacing and Control</i>	4	3	1
PHY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (32 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya 26 kredit daripada kursus dalam senarai Elektif Jabatan, 6 kredit daripada kursus Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 32 kredit kursus elektif./

Students must choose at least 26 course credits listed in the departmental electives courses, 6 credits listed in the general electives or equivalent courses approved by the department to complete the 32 credits of elective courses.

i. Elektif Jabatan/ *Department Electives* (26 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya satu kursus dengan amali daripada senarai di bawah/ *Students must take at least one course with laboratory as listed below.*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3201	Fizik Keadaan Pepejal/ <i>Solid State Physics</i>	3	3	0
PHY4202	Peranti Semikonduktor/ <i>Semiconductor Devices</i>	3	3	0





PHY4203	Sains Bahan/ <i>Materials Science</i>	3	3	0
PHY4207	Teknologi Pemprosesan Bahan/ <i>Materials Processing Technology</i>	3	3	0
PHY4304	Sistem Mikropengawal dan Rekabentuk/ <i>Microcontroller Systems and Design</i>	4	3	1
PHY4305	Instrumentasi Lanjutan/ <i>Advanced Instrumentation</i>	3	3	0
PHY4401	Keelektromagnetan Gunaan/ <i>Applied Electromagnetism</i>	3	3	0
PHY4402	Optik Moden/ <i>Modern Optics</i>	3	3	0
PHY4502	Fizik Sinaran dan Radiobiologi/ <i>Radiation Physics and Radiobiology</i>	3	3	0
PHY4602	Fizik Pengkomputeran/ <i>Computational Physics</i>	4	3	1
PHY4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4
PHY4995	Amali Lanjutan/ <i>Advanced Practicals</i>	3	0	3

ii. Elektif Umum/ *General Elective* (6 Kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is **compulsory** for students to take **2 credits of co-curriculum courses** offered by the university
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.





MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau/ or				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
JUMLAH/ TOTAL		15	13	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
JUMLAH/ TOTAL		15	13	2

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3301	Elektronik Analog/ <i>Analog Electronics</i>	3	2	1
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
JUMLAH/ TOTAL		16	13	3



SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3303	Sensor dan Transduser/ <i>Sensors and Transducers</i>	4	3	1
PHY3305	Instrumentasi Pengenalan/ <i>Introductory Instrumentation</i>	3	3	0
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
JUMLAH/ TOTAL		17	13	4

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3304	Prinsip Sistem Pengukuran/ <i>Principle of Measurement System</i>	4	3	1
PHY4303	Pengantaramukaan Komputer dan Kawalan/ <i>Computer Interfacing and Control</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau/ or				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
JUMLAH/ TOTAL		12	9	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4301	Mikroprosesor & Mikrokomputer/ <i>Microprocessor and microcomputer</i>	3	3	0
PHY4302	Rekabentuk Peralatan Elektronik/ <i>Design of Electronic Equipment</i>	4	3	1
	Elektif Jabatan/ <i>Departmental Electives</i>	6		
	Elektif Umum/ <i>General Elective</i>	3		
JUMLAH/ TOTAL		16		



TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif Jabatan/ <i>Departmental Electives</i>	11		
	JUMLAH/ TOTAL	14		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif Jabatan/ <i>Departmental Electives</i>	9		
	JUMLAH/ TOTAL	12		





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains (Kepujian) Major Kimia/
Bachelor of Science (Honours) Major in Chemistry**

Jumlah Kredit Bergraduat : **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ *University Courses* (18 Kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1

2. Kursus Teras/ *Core Courses* (72 Kredit/ *credits*)

i. Asas/ *Basic* (26 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau				
PHY2001	Fizik Am*/ <i>General Physics*</i>	4	3	1
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1

Nota: * Pelajar lulusan STPM dan Matrikulasi tanpa Fizik perlu mengambil PHY 2001/
Student who have completed Matriculation and STPM without physics are required to take PHY2001

* Pelajar lulusan STPM dan Matrikulasi tanpa Biologi perlu mengambil BGY 2001/
Student who have completed Matriculation and STPM without biology are required to take BGY2001.





ii. Major/ Major (46 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3104	Termodinamik Kimia/ <i>Chemical Thermodynamics</i>	3	2	1
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
CHM3204	Kimia Organik IV/ <i>Organic Chemistry IV</i>	4	3	1
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
CHM3302	Kimia Tak Organik II/ <i>Inorganic Chemistry II</i>	3	2	1
CHM3304	Kimia Tak Organik IV/ <i>Inorganic Chemistry IV</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
CHM4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Electives* (30 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya 15 kredit daripada kursus dalam senarai Elektif Jabatan, 4 kredit daripada kursus Sains Komputer dan Teknologi Maklumat, dan 11 kredit daripada Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 30 kredit kursus elektif. *Students must choose at least 15 course credits listed in the departmental electives, 4 course credits from Computer Science and Information Technology and 11 credits listed in the general electives or equivalent courses approved by the department to complete the 30 elective course credits.*

i. Elektif Jabatan/ *Departmental Electives* (15 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
CHM4101	Kimia Keadaan Pepejal/ <i>Solid State Chemistry</i>	3	3	0
CHM4102	Elektrokimia/ <i>Electrochemistry</i>	3	3	0
CHM4201	Tajuk Khas Kimia Organik/ <i>Special Topics in Organic Chemistry</i>	3	3	0
CHM4701	Pemangkinan/ <i>Catalysis</i>	3	3	0
CHM4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4





- ii. Elektif Sains Komputer dan Teknologi Maklumat/ Computer Science and Information Technology Elective (4 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>	4	3	1
atau/ or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1

- iii. Elektif Umum/ *General Electives* (11 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0
FCE3100	Falsafah Dan Konsep Pendidikan/ <i>Educational Concepts And Philosophy</i>	2	2	0
DCE3203	Kesukarelawan/ <i>Volunteerism</i>	4	4	0
DCE3408	Pembangunan Kepemimpinan/ <i>Leadership Development</i>	3	3	0
FEM3301	Etika dan Nilai Dalam Pembangunan/ <i>Ethics and Values in Development</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory* for students to take **2 credits of co-curriculum courses offered by the university**
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah : (Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>			
atau/ or		4	3	1
PHY2001	Fizik Am*/ <i>General Physics*</i>			
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
JUMLAH/ TOTAL		17	14	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
JUMLAH/ TOTAL		15	12	3

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	3	2	1
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
PHY3103	Fizik II/ <i>Physics I</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		16	12	4





SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3302	Kimia Tak Organik II/ <i>Inorganic Chemistry II</i>	3	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
	Elektif/ <i>Elective</i>	2		
	JUMLAH/ TOTAL	14		

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
	Elektif/ <i>Electives</i>	6		
	JUMLAH/ TOTAL	16		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3304	Kimia Tak Organik IV/ <i>Inorganic Chemistry IV</i>	3	2	1
CHM4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Electives</i>	6		
	JUMLAH/ TOTAL	12		

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3104	Termodinamik Kimia/ <i>Chemical Thermodynamics</i>	3	2	1
CHM3204	Kimia Organik IV/ <i>Organic Chemistry IV</i>	4	3	1
CHM4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Elective</i>	3		
	JUMLAH/ TOTAL	13		





SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>			
atau/ or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
	Elektif/ <i>Electives</i>	9		
	JUMLAH/ TOTAL	16		



STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains (Kepujian) Major Kimia Petroleum/ Bachelor of Science (Honours) Major in Petroleum Chemistry**

Jumlah Kredit Bergraduat : **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ University Courses (18 Kredit/ Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ Malaysian Nationhood	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ Islamic Civilization and Asian Civilization	2	2	0
SKP2204	Hubungan Etnik/ Ethnic Relations	2	2	0
PRT2008	Pertanian dan Manusia/ Agriculture and Man	2	2	0
MGM3180	Asas Keusahawanan/ Basic Entrepreneurship	3	2	1
BBI2423	Academic Interaction and Presentation	3	2	1
BBI2424	Academic Writing	3	2	1

2. Kursus Teras/ Core Courses (72 Kredit/ Credits)

i. Asas/ Basic (26 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ Calculus	3	3	0
MTH3200	Aljabar/ Algebra	3	3	0
BGY2001	Konsep Biologi* / Biological Concept*	4	3	1
atau				
PHY2001	Fizik Am*/ General Physics*	4	3	1
PHY3103	Fizik I/ Physics I	4	3	1
PHY3104	Fizik II/ Physics II	4	3	1
CHM3010	Kimia Fizik dan Tak Organik/ Physical and Inorganic Chemistry	4	3	1
CHM3201	Kimia Organik I/ Organic Chemistry I	4	3	1

Nota:

* Pelajar lulusan STPM dan Matrikulasi tanpa Fizik perlu mengambil PHY 2001/ Students who have completed Matriculation and STPM without physics are required to take PHY2001

* Pelajar lulusan STPM dan Matrikulasi tanpa Biologi perlu mengambil BGY 2001/ Students who have completed Matriculation and STPM without biology are required to take BGY2001



ii. Major/ *Major* (46 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
CHM3303	Kimia Tak Organik III/ <i>Inorganic Chemistry III</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	2	1
CHM3500	Prinsip Teknologi Kimia/ <i>Chemical Technology Principles</i>	4	4	0
CHM3601	Kimia Petroleum/ <i>Petroleum Chemistry</i>	3	3	0
CHM3602	Proses Penapisan Petroleum/ <i>Petroleum Refining Processes</i>	3	3	0
CHM3603	Petrokimia/ <i>Petrochemicals</i>	3	3	0
CHM3604	Kawalan Tumpahan Minyak/ <i>Oil Spill Control</i>	3	3	0
CHM4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (30 Kredit/ *Credits*)

Pelajar mesti memilih sekurang-kurangnya 15 kredit daripada kursus dalam senarai Elektif Jabatan , 4 kredit daripada kursus Sains Komputer dan Teknologi Maklumat, dan 11 kredit daripada Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 30 kredit kursus elektif.

Students must choose at least 15 course credits listed in the departmental electives, 4 course credits from Computer Science and Information Technology and 11 credits listed in the general electives or equivalent courses approved by the department to complete the 30 elective course credits.

Elektif Jabatan/ *Departmental Electives* (15 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3104	Termodinamik Kimia/ <i>Chemical Thermodynamics</i>	3	2	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
CHM3204	Kimia Organik IV/ <i>Organic Chemistry IV</i>	4	3	1
CHM4201	Tajuk Khas Kimia Organik/ <i>Special Topics in Organic Chemistry</i>	3	3	0
CHM4701	Pemangkinan/ <i>Catalysis</i>	3	3	0
CHM4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4



- i. Elektif Sains Komputer Dan Teknologi Maklumat/ *Computer Science and Information Technology Electives* (4 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1

- ii. Elektif Umum/ *General Electives* (11 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Orator</i>	3	3	0
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
DCE3203	Kesukarelawan/ <i>Volunteerism</i>	4	4	0
DCE3408	Pembangunan Kepemimpinan/ <i>Leadership Development</i>	3	3	0
FEM3301	Etika dan Nilai Dalam Pembangunan/ <i>Ethics And Values in Development</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota /Notes :

- Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory* for students to take **2 credits of co-curriculum courses** offered by the university
- Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points



SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>			
atau		4	3	1
PHY2001	Fizik Am*/ <i>General Physics*</i>			
SKP2203	Tamadun Islam Dan Tamadun Asia/ <i>Islamic Civilization And Asian Civilization</i>	2	2	0
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
JUMLAH/ TOTAL		17	14	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
JUMLAH/ TOTAL		15	2	3

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
PHY3103	Fizik II/ <i>Physics I</i>	4	3	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
JUMLAH/ TOTAL		18	13	5



SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
	Elektif/ <i>Electives</i>	3		
	JUMLAH/ TOTAL	15	13	2

TAHUN 3/ 3RD YEARSEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3303	Kimia Tak Organik III/ <i>Inorganic Chemistry III</i>	3	2	1
CHM3500	Prinsip Teknologi Kimia/ <i>Chemical Technology Principles</i>	4	4	0
CHM3601	Kimia Petroleum/ <i>Petroleum Chemistry</i>	3	3	0
	Elektif/ <i>Electives</i>	2		
	JUMLAH/ TOTAL	12		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>			
atau/ or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
CHM3602	Proses Penapisan Petroleum/ <i>Petroleum Refining Processes</i>	3	3	0
	Elektif/ <i>Electives</i>	5		
	JUMLAH/ TOTAL	15		





TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3603	Petrokimia/ <i>Petrochemicals</i>	3	3	0
CHM3604	Kawalan Tumpahan Minyak/ <i>Oil Spill Control</i>	3	3	0
CHM4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Electives</i>	6		
	JUMLAH/ TOTAL	15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Electives</i>	10		
	JUMLAH/ TOTAL	13		



STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program	:	Bachelor Sains (Kepujian) Major Kimia Perindustrian/ <i>Bachelor of Science (Honours) Major in Industrial Chemistry</i>
Jumlah Kredit Bergraduat	:	122 Jam Kredit / <i>Credit Hours</i>
Tempoh Pengajian	:	8 Semester/ <i>Semesters</i> (4 Tahun/ <i>Years</i>)

1. Kursus Universiti/ *University Courses* (18 Kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1

2. Kursus Teras/ *Core Courses* (72 Kredit/ *credits*)

i. Asas/ *Basic* (26 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau				
PHY2001	Fizik Am*/ <i>General Physics*</i>	4	3	1
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1

Nota: * Pelajar lulusan STPM dan Matrikulasi tanpa Fizik perlu mengambil PHY 2001/
Students who have completed Matriculation and STPM without physics are required to take PHY2001

* Pelajar lulusan STPM dan Matrikulasi tanpa Biologi perlu mengambil BGY 2001/
Students who have completed Matriculation and STPM without biology are required to take BGY2001





ii. Major/ Major (46 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
CHM3303	Kimia Tak Organik III/ <i>Inorganic Chemistry III</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
CHM3500	Prinsip Teknologi Kimia/ <i>Chemical Technology Principles</i>	4	4	0
CHM3501	Kimia Perindustrian I/ <i>Industrial Chemistry I</i>	3	3	0
CHM3502	Kimia Perindustrian II/ <i>Industrial Chemistry II</i>	3	3	0
CHM3503	Kimia Polimer Perindustrian/ <i>Industrial Polymer Chemistry</i>	3	3	0
CHM3504	Oleokimia/ <i>Oleochemistry</i>	3	2	1
CHM4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Electives* (30 Kredit/ credits)

Pelajar mesti memilih sekurang-kurangnya 15 kredit daripada kursus dalam senarai Elektif Jabatan, 4 kredit daripada kursus Sains Komputer dan Teknologi Maklumat, dan 11 kredit daripada Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan untuk melengkapkan 30 kredit kursus elektif./

Students must choose at least 15 course credits listed in the departmental electives, 4 course credits from Computer Science and Information Technology and 11 credits listed in the general electives or equivalent courses approved by the department to complete the 30 elective course credits.

i. Elektif Jabatan/ *Departmental Electives* (15 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3104	Termodinamik Kimia/ <i>Chemical Thermodynamics</i>	3	2	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
CHM4101	Kimia Keadaan Pepejal/ <i>Solid State Chemistry</i>	3	3	0
CHM4102	Elektrokimia/ <i>Electrochemistry</i>	3	3	0
CHM4201	Tajuk Khas Kimia Organik/ <i>Special Topics in Organic Chemistry</i>	3	3	0
CHM4701	Pemangkinan/ <i>Catalysis</i>	3	3	0
CHM4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4





- ii. Elektif Sains Komputer dan Teknologi Maklumat/ *Computer Science and Information Technology Electives* (4 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>			
atau/ or		4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>			

- iii. Elektif Umum/ *General Electives* (11 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
DCE3203	Kesukarelawanan/ <i>Volunteerism</i>	4	4	0
DCE3408	Pembangunan Kepemimpinan/ <i>Leadership Development</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota /Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is **compulsory for students to take 2 credits of co-curriculum courses offered by the university**
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>			
atau				
PHY2001	Fizik Am*/ <i>General Physics*</i>	4	3	1
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
JUMLAH/ TOTAL		17	14	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
JUMLAH/ TOTAL		16	13	3

TAHUN 2/ 2ND SEMESTER

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3301	Kimia Tak Organik II/ <i>Inorganic Chemistry I</i>	3	2	1
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
PHY3103	Fizik II/ <i>Physics I</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		16	12	4





SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
CHM3303	Kimia Tak Organik III/ <i>Inorganic Chemistry III</i>	3	2	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
JUMLAH/ TOTAL		16	12	4

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3501	Kimia Perindustrian I/ <i>Industrial Chemistry I</i>	3	3	0
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3701	Kimia Pengkomputeran/ <i>Computational Chemistry</i>			
atau/ or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
	Elektif/ <i>Electives</i>	5		
JUMLAH/ TOTAL		15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3502	Kimia Perindustrian II/ <i>Industrial Chemistry II</i>	3	3	0
CHM3503	Kimia Polimer Perindustrian/ <i>Industrial Polymer Chemistry</i>	3	3	0
	Elektif/ <i>Electives</i>	6		
JUMLAH/ TOTAL		12		





TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3500	Prinsip Teknologi Kimia/ <i>Chemical Technology Principles</i>	4	4	0
CHM3504	Oleokimia/ <i>Oleochemistry</i>	3	2	1
CHM4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Electives</i>	6		
	JUMLAH/ TOTAL	16		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
	Elektif/ <i>Electives</i>	9		
	JUMLAH/ TOTAL	12		



STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains (Kepujian) Major Matematik/**
Bachelor of Science (Honours) Major in Mathematics

Jumlah Kredit Bergraduat : **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ *University Courses* (23 Kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	3	0
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0

2. Kursus Teras/ *Core Courses* (61 kredit/ *credits*)

i. Asas/ *Basic* (19 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1



ii. Major/ Major (42 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3103	Analisis Vektor/ <i>Vector Analysis</i>	3	3	0
MTH3104	Kaedah Matematik/ <i>Mathematical Methods</i>	3	3	0
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3202	Pengenalan Kepada Aljabar Moden/ <i>Introduction to Modern Algebra</i>	3	3	0
MTH3301	Analisis Nyata/ <i>Real Analysis</i>	3	3	0
MTH3302	Analisis Kompleks/ <i>Complex Analysis</i>	3	3	0
MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
MTH3406	Kawalan Kualiti Berstatistik/ <i>Statistical Quality Control</i>	3	3	0
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
MTH3701	Matematik Kewangan/ <i>Financial Mathematics</i>	3	3	0
MTH3901	Proses Penyelidikan Dalam Matematik dan Statistik/ <i>Research Processes in Mathematics and Statistics</i>	3	1	2
MTH4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (36 Kredit/ Credits)

Pelajar perlu mengambil 36 kredit kursus elektif yang terdiri daripada Elektif Asas, Elektif Matematik dan Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan/ *Students must take 36 elective course credits from Basic Electives, Mathematics Electives and General Elective courses that are listed or equivalent courses approved by the Department*

i. Elektif Asas/ *Basic Electives* (12/14kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
atau				
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
atau				





CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM4001 atau/or	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
SSK 3100	Pengaturcaraan Komputer I/ <i>Computer Programming I</i>	4	3	1
SSK 3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
SSK3002	Teknologi Maklumat Dan Penggunaannya/ <i>Information Technology And Its Applications</i>	3	2	1
SKM2300 atau / or	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3	3	0
ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3	3	0
ECN3161 atau / or	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
ECN4181 atau	Ekonomi Antarabangsa/ <i>International Economics</i>	3	3	0
ECN3111 atau / or	Sejarah Pemikiran Ekonomi/ <i>History of Economics Thought</i>	3	3	0
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
ACT3121	Perakaunan Kewangan Pertengahan 1/ <i>Intermediate Financial Accounting 1</i>	3	3	0
ACT3122 Atau / or	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting II</i>	3	3	0





BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1

ii. Elektif Matematik Tulen/ *Pure Mathematics Electives* (12/16 kredit/ *credits*)

Pelajar perlu mengambil sekurang-kurangnya 4 kursus MTH 4XXX tidak termasuk MTH 4901 (Latihan Industri)/ *Students must take at least 4 MTH 4XXX courses excluding MTH 4901 (Industrial Training)*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A
MTH4102	Teori Persamaan Pembezaan Biasa / <i>Theory of Ordinary Differential Equations</i>	3	3	0
MTH4105	Teori Persamaan Kamiran/ <i>Theory of Integral Equations</i>	3	3	0
MTH4201	Aljabar Niskala/ <i>Abstract Algebra</i>	3	3	0
MTH4202	Teori Nombor/ <i>Number Theory</i>	3	3	0
MTH4203	Pengenalan Kepada Teori Graf/ <i>Introduction to Graph Theory</i>	3	3	0
MTH4204	Kombinatorik/ <i>Combinatorics</i>	3	3	0
MTH4205	Kriptografi Bermatematik/ <i>Mathematical Cryptography</i>	3	3	0
MTH4301	Topologi/ <i>Topology</i>	3	3	0
MTH4302	Analisis Fungsian/ <i>Functional Analysis</i>	3	3	0
MTH4800	Sejarah Matematik/ <i>History of Mathematics</i>	3	3	0
MTH4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4

iii. Elektif Matematik Gunaan/ *Applied Mathematics Electives* (12/16 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4102	Teori Persamaan Pembezaan Biasa / <i>Theory of Ordinary Differential Equations</i>	3	3	0
MTH4105	Teori Persamaan Kamiran/ <i>Theory of Integral Equations</i>	3	3	0
MTH4106	Persamaan Pembezaan Separat/ <i>Partial Differential Equations</i>	3	3	0
MTH4205	Kriptografi Bermatematik/ <i>Mathematical Cryptography</i>	3	3	0





MTH4501	Tajuk Pilihan dalam Analisis Berangka/ <i>Selected Topics in Numerical Analysis</i>	3	3	0
MTH4502	Teori Penghampiran/ <i>Approximation Theory</i>	3	3	0
MTH4602	Kawalan Optimum/ <i>Optimal Control</i>	3	3	0
MTH4603	Pengenalan kepada Penyelidikan Operasi/ <i>Introduction to Operations Research</i>	3	3	0
MTH4604	Teknik Pengoptimuman/ <i>Optimization Techniques</i>	3	3	0
MTH4605	Pengenalan Kepada Teori Kawalan/ <i>Introduction to Control Theory</i>	3	3	0
MTH4606	Tajuk Khas dalam Matematik Gunaan/ <i>Special Topics in Applied Mathematics</i>	3	3	0
MTH4800	Sejarah Matematik/ <i>History of Mathematics</i>	3	3	0
MTH4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4

iv. Elektif Umum/ *General Electives* (6/8 /10/12 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
FEM3301	Etika dan Nilai Dalam Pembangunan/ <i>Ethics and Values in Development</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1
BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory* for students to take **2 credits of co-curriculum courses** offered by the university
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah : (Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3/4		
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
MGM3180	Asas Keusahawanan	3	2	1
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
JUMLAH/ TOTAL		17/18		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3/4		
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	Academic Interaction and Presentation	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		16/17		

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
BBI2424	Academic Writing	3	2	1
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0
JUMLAH/ TOTAL		14	13	1





SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3103	Analisis Vektor/ <i>Vector Analysis</i>	3	3	0
MTH3202	Pengenalan kepada Aljabar Moden/ <i>Introduction to Modern Algebra</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3		
JUMLAH/ TOTAL		16		

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3301	Analisis Nyata/ <i>Real Analysis</i>	3	3	0
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
MTH3701	Matematik Kewangan/ <i>Financial Mathematics</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3		
JUMLAH/ TOTAL		15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3104	Kaedah Matematik/ <i>Mathematical Methods</i>	3	3	0
MTH3302	Analisis Kompleks/ <i>Complex Analysis</i>	3	3	0
MTH3406	Kawalan Kualiti Berstatistik/ <i>Statistical Quality Control</i>	3	3	0
MTH3901	Proses Penyelidikan Dalam Matematik dan Statistik/ <i>Research Processes in Mathematics and Statistics</i>	3	1	2
	Elektif Umum/ <i>General Elective</i>	3		
JUMLAH/ TOTAL		15		





TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MTH 4***	Elektif Matematik Tulen/Gunaan	6		
	Elektif Umum/ <i>General Elective</i>	4/6		
JUMLAH/ TOTAL		13/15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MTH 4***	Elektif Matematik Tulen/Gunaan	6		
	Elektif Umum/ <i>General Elective</i>	3		
JUMLAH/ TOTAL		12		





STRUKTUR KURIKULUM/ *CURRICULUM STRUCTURE*

Nama Program : **Bachelor Sains (Kepujian) Major Statistik/**
Bachelor of Science (Honours) Major in Statistics

Jumlah Kredit Bergraduat : **122 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ *University Courses* (23 Kredit / Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	3	0
BBI2424	<i>Academic Writing</i>	3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0

2. Kursus Teras/ *Core Courses* (61 Kredit/ Credits)

i. Asas/ *Basic* (19 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1





ii. Major/ Major (42 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
MTH3403	Rekabentuk Ujikaji/ <i>Experimental Design</i>	3	3	0
MTH3404	Model Linear/ <i>Linear Model</i>	3	3	0
MTH3405	Tajuk-Tajuk Khas Dalam Penggunaan Pakej Statistik/ <i>Special Topics in Application of Statistical Package</i>	3	2	1
MTH3406	Kawalan Kualiti Berstatistik/ <i>Statistical Quality Control</i>	3	3	0
MTH3407	Kebarangkalian Pertengahan/ <i>Intermediate Probability</i>	3	3	0
MTH3408	Pengenalan Kepada Kaedah Bayes/ <i>Introduction to Bayesian Method</i>	3	3	0
MTH3409	Statistik Berkomputasi/ <i>Computational Statistics</i>	3	2	1
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
MTH3901	<i>Proses Penyelidikan Dalam Matematik dan Statistik/ Research Processes in Mathematics and Statistics</i>	3	1	2
MTH4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

3. Kursus Elektif/ *Elective Courses* (36 Kredit/ Credits)

Pelajar perlu mengambil 36 kredit kursus elektif yang terdiri daripada Elektif Asas, Elektif Statistik dan Elektif Umum yang tersenarai atau kursus setara yang dipersetujui oleh Jabatan/
Students must take 36 elective course credits from Basic Electives, Mathematics Electives and General Elective courses that are listed or equivalent courses approved by the Department

i. Elektif Asas/ *Basic Electives* (12/16 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0





PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
atau / or				
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
atau / or				
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
atau / or				
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming</i>	4	3	1
SSK3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
SSK3002	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
atau / or				
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3	3	0
ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
atau / or				
ECN4181	Ekonomi Antarabangsa/ <i>International Economics</i>	3	3	0
atau / or				
ECN3111	Sejarah Pemikiran Ekonomi/ <i>History of Economics Thought</i>	3	3	0
atau / or				
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
ACT3121	Perakaunan Kewangan Pertengahan 1/ <i>Intermediate Financial Accounting1</i>	3	3	0





ACT3122 atau / or	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting I</i>	3	3	0
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1

ii. Elektif Statistik/ *Statistic Electives* (12/16 kredit/ *credits*)

Pelajar perlu mengambil sekurang-kurangnya 4 kursus MTH 4XXX tidak termasuk MTH 4901 (Latihan Industri)/ *Students must take at least 4 MTH 4XXX courses excluding MTH 4901 (Industrial Training)*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4401	Teknik Tinjauan/ <i>Survey Techniques</i>	3	3	0
MTH4403	Statistik Tak Berparameter/ <i>Nonparametric Statistics</i>	3	3	0
MTH4404	Proses Stokastik/ <i>Stochastic Processes</i>	3	3	0
MTH4405	Pengenalan kepada Analisis Multivariat/ <i>An Introduction to Multivariate Analysis</i>	3	3	0
MTH4406	Siri Masa/ <i>Time Series</i>	3	3	0
MTH4407	Kaedah Interaktif Berkomputasi dalam Analisis Data/ <i>Interactive Computational Methods In Data Analysis</i>	3	3	0
MTH4603	Pengenalan kepada Penyelidikan Operasi/ <i>Introduction to Operations Research</i>	3	3	0
MTH4901	Latihan Industri/ <i>Industrial Training</i>	4	0	4

iii. Elektif Umum/ *General Elective* (6/8/10/12 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
FEM3301	Etika dan Nilai dalam Pembangunan/ <i>Ethics And Values in Development</i>	3	3	0
BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3	2	1





BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3	2	1
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Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory for students to take 2 credits of co-curriculum courses offered by the university*
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3/4		
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
MGM3180	Asas Keusahawanan	3	2	1
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
JUMLAH/ TOTAL		17/18		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3/4		
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
BBI2423	Academic Interaction and Presentation	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		16/17		

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
BBI2424	Academic Writing	3	2	1
FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2	2	0
JUMLAH/ TOTAL		14	13	1





SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3403	Rekabentuk Ujikaji/ <i>Experimental Design</i>	3	3	0
MTH3404	Model Linear/ <i>Linear Model</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3		
JUMLAH/ TOTAL		16		

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3407	Kebarangkalian Pertengahan/ <i>Intermediate Probability</i>	3	3	0
MTH3405	Tajuk-Tajuk Khas Dalam Penggunaan Pakej Statistik/ <i>Special Topics in Application of Statistical Package</i>	3	2	1
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
	Elektif Asas/ <i>Basic Elective</i>	3		
JUMLAH/ TOTAL		15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3406	Kawalan Kualiti Berstatistik/ <i>Statistical Quality Control</i>	3	3	0
MTH3408	Pengenalan Kepada Kaedah Bayes/ <i>Introduction to Bayesian Method</i>	3	3	0
MTH3409	Statistik Berkomputasi/ <i>Computational Statistics</i>	3	2	1
MTH3901	Proses Penyelidikan Dalam Matematik dan Statistik/ <i>Research Processes in Mathematics and Statistics</i>	3	1	2
	Elektif Umum/ <i>General Elective</i>	3		
JUMLAH/ TOTAL		15		





TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MTH 4***	Elektif Statistik/ <i>Statistics Elective</i>	6		
	Elektif Umum/ <i>General Elective</i>	4/6		
JUMLAH/ TOTAL		13/15		

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MTH 4***	Elektif Statistik/ <i>Statistics Elective</i>	6		
	Elektif Umum/ <i>General Elective</i>	3		
JUMLAH/ TOTAL		12		



STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains Dengan Pendidikan (Kepujian) Major Fizik/**
Bachelor of Science with Education (Honours) Major in Physics

Jumlah Kredit Bergraduat : **135 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ *University Courses* (20 Kredit / *Credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	Academic Interaction and Presentation	3	2	1
BBI2424	Academic Writing	3	2	1
PRT2008	<i>Pertanian dan Manusia/ Agriculture and Man</i>	2	2	0
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ *Core Courses* (75/80/81/82/83 Kredit credits)

i. Subjek Utama/ *Main Subjects* (69 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
PHY3301	Elektronik Analog/ <i>Analog Electronics</i>	3	2	1





PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
PHY3602	Mekanik Statistik/ <i>Statistical Mechanics</i>	3	3	0
PHY3604	Kaedah Matematik dalam Fizik/ <i>Mathematical Methods in Physics</i>	3	3	0
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
PHY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

Nota: * Pelajar lulusan STPM dan Matrikulasi tanpa subjek Biologi dikehendaki mengambil BGY 2001./ *Students who have completed Matriculation and STPM without biology are required to take BGY2001*
** Pelajar lulusan STPM dan Matrikulasi tanpa subjek Kimia dikehendaki mengambil CHM 2000. *Students who have completed Matriculation and STPM without Chemistry are required to take PHY2001*

Pelajar perlu memilih 9 kredit (3 kursus) kursus PHY dari yang di bawah untuk melengkapkan 69 kredit subjek utama./ *Students must choose 9 credits (3 courses) from the PHY courses listed below to complete the 69 major subject credits .*

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3305	Instrumentasi Pengenalan/ <i>Introductory Instrumentation</i>	3	3	0
PHY3603	Mekanik Klasik/ <i>Classical Mechanics</i>	3	3	0
PHY4202	Peranti Semikonduktor/ <i>Semiconductor Devices</i>	3	3	0
PHY4203	Sains Bahan/ <i>Materials Science</i>	3	3	0
PHY4402	Optik Moden/ <i>Modern Optics</i>	3	3	0
PHY4502	Fizik Sinaran dan Radiobiologi/ <i>Radiation Physics and Radiobiology</i>	3	3	0
PHY4504	Fizik Nuklear/ <i>Nuclear Physics</i>	3	3	0
PHY4902	Kursus Khas/ <i>Special Topics</i>	3	3	0

ii. Subjek Kedua / *Secondary Subject* (6/11/12/13/14 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
Matematik/ <i>Mathematics</i>				
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0





MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
atau Kimia/ or Chemistry				
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
atau Komputer/ or Computer				
SSK3000	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1
SSK3100	Pengaturcaraan Komputer I/ <i>Computer Programming I</i>	4	3	1
SSK3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
atau Ekonomi/ or Economy				
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3	3	0
ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
atau				
ECN4181	Ekonomi Antarabangsa/ <i>International Economics</i>	3	3	0
atau				
ECN3111	Sejarah Pemikiran Ekonomi/ <i>History of Economics Thought</i>	3	3	0
atau Perakaunan/ or Account				
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
ACT3121	Perakaunan Kewangan Pertengahan I/ <i>Intermediate Financial Accounting I</i>	3	3	0
ACT3122	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting II</i>	3	3	0
atau Biologi/ or Biology				
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1





3. Kursus Pendidikan/ *Educational Courses* (38 Kredit/ *Credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
FCE3200	Psikologi Pendidikan/ <i>Educational Psychology</i>	3	3	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
STE3502	Kaedah Mengajar Fizik/ <i>Physic Teaching Method</i>	3	2	1
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
STE3400/ STE3503/ STE3700/ STE3300/ STE3303/ STE3501	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/Kimia/ Komputer dan Teknologi Maklumat/ Perakaunan/ Ekonomi/ Biologi)	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is *compulsory for students to take 2 credits of co-curriculum courses offered by the university*
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>	4	3	1
atau				
CHM2000	Kimia Am*/ <i>General Chemistry*</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
JUMLAH/ TOTAL		16	14	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
FCE3000	Kokurikulum/ <i>Co-Curriculum-</i>	3	2	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
JUMLAH/ TOTAL		17	14	3

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
PHY3604	Kaedah Matematik dalam Fizik/ <i>Mathematical Methods in Physics</i>	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		18	16	2



SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
PHY3302	Elektronik Berdigit/ <i>Digital Electronics</i>	3	2	1
PHY3601	Mekanik Kuantum/ <i>Quantum Mechanics</i>	3	3	0
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
atau				
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
JUMLAH/ TOTAL		19	16	3

TAHUN 3/ 3RD YEARSEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
atau	Kimia Analisis/ <i>Analytical Chemistry</i>			
CHM3401		3	2	1
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
JUMLAH/ TOTAL		18	15	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
STE3502	Kaedah Mengajar Fizik	3	2	1
STE3400/ STE3503/ STE3700/ STE3300/ STE3303/ STE3501	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/Kimia/ Komputer dan Teknologi Maklumat/ Perakaunan/ Ekonomi/ Biologi)	3	2	1
FCE3200	Psikologi Pendidikan/ <i>Educational Psychology</i>	3	3	0





MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
atau				
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
PHY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
JUMLAH/ TOTAL		18	13	5

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
	Elektif PHY/ <i>Elective PHY</i>	6	6	0
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
PHY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
JUMLAH/ TOTAL		12	8	4

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
JUMLAH/ TOTAL		15	6	9





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains Dengan Pendidikan (Kepujian) Major Kimia/ *Bachelor of Science with Education (Honours) Major in Chemistry***

Jumlah Kredit Bergraduat : **135/139/141/142/143 Jam Kredit / *Credit Hours***

Tempoh Pengajian : **8 Semester/ *Semesters* (4 Tahun/ *Years*)**

1. Kursus Universiti/ *University Courses* (20 Kredit / *Credits*)

KOD KURSUS/ <i>COURSE CODE</i>	NAMA KURSUS/ <i>COURSE NAME</i>	Kr	K	A/T
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BB12423	<i>Academic Interaction and Presentation</i>	3	2	1
BB12424	<i>Academic Writing</i>	3	2	1
PRT2008	<i>Pertanian dan Manusia/ Agriculture and Man</i>	2	2	0
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ *Core Courses* (75/79/81/82/83 Kredit credits)

i. Subjek Utama/ *Main Subjects* (69 kredit/ *credits*)

KOD KURSUS/ <i>COURSE CODE</i>	NAMA KURSUS/ <i>COURSE NAME</i>	Kr	K	A/T
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>			
atau		4	3	1
PHY2001	Fizik Am*/ <i>General Physics *</i>			
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
PHY3103	Fizik II/ <i>Physics I</i>	4	3	1
PHY3104	Fizik III/ <i>Physics II</i>	4	3	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1



CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
CHM3302	Kimia Tak Organik II/ <i>Inorganic Chemistry II</i>	3	2	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
CHM4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

Nota: * Pelajar lulusan STPM dan Matrikulasi tanpa subjek Biologi dikehendaki mengambil BGY2001./ *Students who have completed Matriculation and STPM without biology are required to take BGY2001*
 ** Pelajar lulusan STPM dan Matrikulasi tanpa subjek Fizik dikehendaki mengambil PHY2001./ *Students who have completed Matriculation and STPM without Physics are required to take PHY2001*

ii. Subjek Kedua / *Secondary Subjects* (6/10/12/13/14 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
Matematik/ Mathematics				
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
atau Fizik/ or Physics				
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
atau				
PHY3201	Fizik Keadaan Pepejal/ <i>Solid State Physics</i>			
atau Biologi/ or Biology				
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1
atau Komputer/ or Computer				
SSK3000	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1



SSK3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
atau Ekonomi/ or Economy				
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3	3	0
ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3	3	0
ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3	3	0
atau				
ECN4181	Ekonomi Antarabangsa/ <i>International Economics</i>	3	3	0
atau				
ECN3111	Sejarah Pemikiran Ekonomi/ <i>History of Economics Thought</i>	3	3	0
atau Perakaunan/ or Accounts				
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
ACT3121	Perakaunan Kewangan Pertengahan I/ <i>Intermediate Financial Accounting I</i>	3	3	0
ACT3122	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting II</i>	3	3	0

3. Kursus Pendidikan/ *Educational Courses* (38 Kredit/ *Credits*)

KOD KURSUS/ <i>COURSE CODE</i>	NAMA KURSUS/ <i>COURSE NAME</i>	Kr	K	A/T
FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3	2	1
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
FCE3200	Psikologi Pendidikan/ <i>Educational Psychology</i>	3	3	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1





STE3503	Kaedah Mengajar Kimia/ <i>Chemistry Teaching Method</i>	3	2	1
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
STE3300/ STE3303/ STE3400/ STE3501/ STE3700	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/ Komputer dan Teknologi Maklumat/ Perakaunan/ Ekonomi/ Biologi)	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is **compulsory for students to take 2 credits of co-curriculum courses offered by the university**
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
BGY2001	Konsep Biologi* / <i>Biological Concept*</i>			
atau		4	3	1
PHY20001	Fizik Am*/ <i>General Physics*</i>			
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
JUMLAH/ TOTAL		18	15	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
CHM3301	Kimia Tak Organik I/ <i>Inorganic Chemistry I</i>	3	2	1
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
BBi2423	<i>Academic Interaction And Presentation</i>	3	2	1
JUMLAH/ TOTAL		20	17	3





TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3101	Kimia Fizik/ <i>Physical Chemistry</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
SSK3100	Pengaturcaraan Komputer 1/ <i>Computer Programming I</i>	4	3	1
BBI2424	<i>Academic Writing</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
JUMLAH/ TOTAL		20	15	5

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3202	Kimia Organik II/ <i>Organic Chemistry II</i>	4	3	1
CHM3402	Spektroskopi Kimia/ <i>Chemical Spectroscopy</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
BGY/MTH/PHY/ ECN/ECT/SSK	Subjek Kedua	3	3	0
		atau/ or		
		3	2	1
		atau/ or		
FCE3000	Kokurikulum/ Co-Curriculum	4	3	1
		3	2	1
JUMLAH/ TOTAL		18/19	14/15	4/5

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3103	Kinetik Kimia/ <i>Chemical Kinetics</i>	3	2	1
CHM3203	Kimia Organik III/ <i>Organic Chemistry III</i>	3	2	1
FCE3200	Psikologi Pendidikan/ <i>Educational Psycology</i>	3	3	0





		3	3	0
BGY/MTH/PHY/ ECN/ECT/SSK	Subjek Kedua	atau/ or 3	2	1
		atau/ or 4	3	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
JUMLAH/ TOTAL		18/19	13/14	4/5

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM3102	Kimia Polimer/ <i>Polymer Chemistry</i>	3	2	1
CHM3302	Kimia Tak Organik II/ <i>Inorganic Chemistry II</i>	3	2	1
CHM4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
		3	3	0
BGY/ECN/ECT/ SSK	Subjek Kedua	atau/ or 3	2	1
		atau/ or 4	3	1
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
STE3400/ STE3700/ STE3300/ STE3303/ STE3501	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/ Komputer dan Teknologi Maklumat/ Perakaunan/ Ekonomi/ Biologi)	3	2	1
JUMLAH/ TOTAL		20/21	12/13	7/8

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
CHM4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3





BGY/ECN/ECT/ SSK	Subjek Kedua	3	3	0
		atau/ or		
		3	2	1
		atau/ or		
		4	3	1
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
STE3503	Kaedah Mengajar Kimia/ <i>Chemistry Teaching Method</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
JUMLAH/ TOTAL		17/18	11/12	5/6

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
JUMLAH/ TOTAL		8	0	8



STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains Dengan Pendidikan (Kepujian) Major Matematik/ Bachelor of Science with Education (Honours) Major in Mathematics**

Jumlah Kredit Bergraduat : **135 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4 Tahun/ Years)**

1. Kursus Universiti/ University Courses (20 Kredit / Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	3	0
BBI2424	<i>Academic Writing</i>	3	2	1
PRT2008	<i>Pertanian dan Manusia/ Agriculture and Man</i>	2	2	0
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ Core Courses (75/80/81/82/83 Kredit credits)

i. Subjek Utama/ Main Subjects (69 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3103	Analisis Vektor/ <i>Vector Analysis</i>	3	3	0
MTH3104	Kaedah Matematik/ <i>Mathematical Methods</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3202	Pengenalan Kepada Aljabar Moden/ <i>Introduction to Modern Algebra</i>	3	3	0
MTH3301	Analisis Nyata/ <i>Real Analysis</i>	3	3	0
MTH3302	Analisis Kompleks/ <i>Complex Analysis</i>	3	3	0
MTH3401	Kebarangkalian dan Statistik II/ <i>Probability and Statistics I</i>	3	3	0





MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
MTH3901	Proses Penyelidikan Dalam Matematik dan Statistik/ <i>Research Processes in Mathematics and Statistics</i>	3	1	2
MTH4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

Pilih sekurang-kurangnya 9 kredit krusus MTH4XXX sama ada elektif matematik tulen atau matematik gunaan yang tersenarai di bawah untuk melengkapkan 64 kredit subjek utama.

Choose at least 9 MTH 4XXX credits whether they are pure mathematics or applied mathematics electives as listed below to complete the 64 major subjects credits.

Elektif Matematik Tulen/ *Pure Mathematics electives*

MTH4201	Aljabar Niskala/ <i>Abstract Algebra</i>	3	3	0
MTH4202	Teori Nombor/ <i>Number Theory</i>	3	3	0
MTH4203	Pengenalan Kepada Teori Graf/ <i>Introduction to Graph Theory</i>	3	3	0
MTH4204	Kombinatorik/ <i>Combinatorics</i>	3	3	0
MTH4301	Topologi/ <i>Topology</i>	3	3	0
MTH4302	Analisis Fungsian/ <i>Functional Analysis</i>	3	3	0
MTH4800	Sejarah Matematik/ <i>History of Mathematics</i>	3	3	0

Elektif Matematik Gunaan/ *Applied Mathematics electives*

MTH4102	Teori Persamaan Pembezaan Biasa/ <i>Theory of Ordinary Differential Equations</i>	3	3	0
MTH4105	Teori Persamaan Kamiran/ <i>Theory of Integral Equations</i>	3	3	0
MTH4106	Persamaan Pembezaan Separa/ <i>Partial Differential Equations</i>	3	3	0
MTH4501	Tajuk Pilihan dalam Analisis Berangka/ <i>Selected Topics in Numerical Analysis</i>	3	3	0
MTH4502	Teori Penghampiran/ <i>Approximation Theory</i>	3	3	0
MTH4602	Kawalan Optimum/ <i>Optimal Control</i>	3	3	0
MTH4603	Pengenalan kepada Penyelidikan Operasi/ <i>Introduction to Operations Research</i>	3	3	0





MTH4604	Teknik Pengoptimuman/ <i>Optimization Techniques</i>	3	3	0
MTH4605	Pengenalan Kepada Teori Kawalan/ <i>Introduction to Control Theory</i>	3	3	0
MTH4606	Tajuk Khas dalam Matematik Gunaan/ <i>Special Topics in Applied Mathematics</i>	3	3	0
MTH4800	Sejarah Matematik/ <i>History of Mathematics</i>	3	3	0

Nota: * Pelajar lulusan STPM dan Matrikulasi tanpa subjek Biologi dikehendaki mengambil BGY2001/ *Students who have completed Matriculation and STPM without biology are required to take BGY2001*

** Pelajar lulusan STPM dan Matrikulasi tanpa subjek Fizik dikehendaki mengambil PHY2001/ *Students who have completed Matriculation and STPM without physics are required to take PHY2001*

ii. Subjek Kedua / *Secondary Subject* (6/10/12/13/14 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
Fizik/ or Physics				
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik II/ <i>Physics II</i>	4	3	1
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
atau				
PHY3201	Fizik Keadaan Pepejal/ <i>Solid States Physics</i>	3	3	0
atau Kimia/ or Chemistry				
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
atau Komputer/ or Computer				
SSK3000	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1
SSK3100	Pengaturcaraan Komputer I/ <i>Computer Programming I</i>	4	3	1
SSK3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction To Multimedia</i>	3	2	1
atau Ekonomi/ or Economy				
ECN3100	Prinsip Ekonomi/ <i>Principles of Economics</i>	3	3	0
ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3	3	0





ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3	3	0
		3	3	0
ECN3161 atau	Ekonomi Malaysia/ <i>Malaysian Economics</i>			
	Ekonomi Antarabangsa/ <i>International Economics</i>			
ECN4181 atau	Sejarah Pemikiran Ekonomi/ <i>History of Economics Thought</i>	3	3	0
ECN3111		3	3	0
atau Perakaunan/ or Accounts				
ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4	3	1
ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost and Management Accounting</i>	3	3	0
ACT3121	Perakaunan Kewangan Pertengahan I/ <i>Intermediate Financial Accounting I</i>	3	3	0
ACT3122	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting II</i>	3	3	0
atau Biologi/ or Biology				
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1

3. Kursus Pendidikan/ *Educational Courses* (38 Kredit/ *Credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept Of Education</i>	2	2	0
FCE3200	Psikologi Pendidikan/ <i>Educational Psychology</i>	3	3	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
STE3400	Kaedah Mengajar matematik/ <i>Mathematics Teaching Method</i>	3	2	1





FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
STE3502/ STE3503/ STE3700/ STE3303/ STE3300/ STE3501	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Fizik/Kimia/ Komputer dan Teknologi Maklumat/ Ekonomi/ Perakaunan/ Biologi)	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is **compulsory for students to take 2 credits of co-curriculum courses offered by the university**
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points





SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
PHY/CHM/SSK/ ECN/ACT/BGY	Subjek Kedua	3/4		
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
MGM3180	Asas Keusahawanan	3	2	1
JUMLAH/ TOTAL		17/18	14/15	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
MTH3101	Kalkulus Lanjutan/ <i>Advanced Calculus</i>	3	3	0
PHY/CHM/SSK/ ECN/ACT/BGY	Subjek Kedua	3/4		
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
FCE3000	Kokurikulum/ <i>Co Curriculum</i>	3	2	1
BB12423	<i>Academic Interaction and Presentation</i>	3	3	0
JUMLAH/ TOTAL		17/18	16/17	1

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3201	Aljabar Linear/ <i>Linear Algebra</i>	3	3	0
MTH3402	Kebarangkalian dan Statistik II/ <i>Probability and Statistics II</i>	3	3	0
MTH3500	Pengaturcaraan Komputer dalam Matematik/ <i>Computer Programming in Mathematics</i>	4	3	1





BBI2424	Academic Writing	3	2	1
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
JUMLAH/ TOTAL		18	16	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3103	Analisis Vektor/ <i>Vector Analysis</i>	3	3	0
MTH3202	Pengenalan Kepada Aljabar Moden/ <i>Introduction to Modern Algebra</i>	3	3	0
MTH3501	Analisis Berangka/ <i>Numerical Analysis</i>	3	3	0
MTH3901	Proses Penyelidikan Dalam Matematik dan Statistik/ <i>Research Processes in Mathematics and Statistics</i>	3	1	2
PHY/CHM/SSK/ ECN/ACT/BGY	Subjek Kedua	3		
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
JUMLAH/ TOTAL		17	15	2

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH3104	Kaedah Matematik/ <i>Mathematical Methods</i>	3	3	0
MTH3301	Analisis Nyata/ <i>Real Analysis</i>	3	3	0
MTH3302	Analisis Kompleks/ <i>Complex Analysis</i>	3	3	0
MTH3602	Pengaturcaraan Bermatematik/ <i>Mathematical Programming</i>	3	3	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
PHY/CHM/SSK/ ECN/ACT/BGY	Subjek Kedua	3		
JUMLAH/ TOTAL		18	17	1

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3





MTH4102 hingga/ to MTH4800	Elektif Matematik Tulen/ Gunaan / <i>Pure/ Applied Mathematics elective</i>	6		
FCE3200	Psikologi Pendidikan/ <i>Educational Phychology</i>	3	3	0
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
JUMLAH/ TOTAL		18	13	5

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
MTH4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MTH4102 hingga/ to MTH4800	Elektif Matematik Tulen/ Gunaan/ <i>Pure / Applied Mathematics electives</i>	3		
STE3502/ STE3503/ STE3700/ STE3303/ STE3300/ STE3501	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Fizik/ Kimia/ Komputer dan Teknologi Maklumat/ Ekonomi/ Perakaunan/ Biologi)	3	2	1
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
STE3400	Kaedah Mengajar Matematik/ <i>Mathematics Teaching Method</i>	3	2	1
JUMLAH/ TOTAL		12	8	4

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
JUMLAH/ TOTAL		12	4	8





STRUKTUR KURIKULUM/ CURRICULUM STRUCTURE

Nama Program : **Bachelor Sains Dengan Pendidikan (Kepujian) Major Biologi/**
Bachelor of Science with Education (Honours) Major in Biology

Jumlah Kredit Bergraduat : **131-139 Jam Kredit / Credit Hours**

Tempoh Pengajian : **8 Semester/ Semesters (4Tahun/ Years)**

1. Kursus Universiti/ University Courses (21 Kredit / Credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
BBI2424	<i>Academic Writing</i>	3	2	1
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1

2. Kursus Teras/ Core Courses (70/75/76/78 Kredit credits)

i. Subjek Utama/ Main Subjects (64 kredit/ credits)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
BGY3100	Biologi Mikroorganisma/ <i>Biology of Microorganisms</i>	3	2	1
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
PHY2001	Fizik Am/ <i>General Physics</i>	4	3	1
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1





BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1
BGY3201	Struktur dan Fungsi Tumbuhan/ <i>Plant Structure and Function</i>	3	2	1
BGY3202	Struktur dan Fungsi Haiwan/ <i>Animal Structure and Function</i>	3	2	1
BGY3701	Biostatistik/ <i>Biostatistics</i>	3	2	1
BGY3301	Fisiologi Tumbuhan/ <i>Plant Physiology</i>	4	3	1
BGY3302	Fisiologi Haiwan/ <i>Animal Physiology</i>	4	3	1
BGY3401	Ekologi/ <i>Ecology</i>	3	2	1
BGY3501	Genetik/ <i>Genetics</i>	4	3	1
BGY4999	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	6	0	6

ii. Subjek Kedua / *Secondary Subjects* (6/11/12/14 kredit/ *credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
Kimia/Chemistry				
CHM3401	Kimia Analisis/ <i>Analytical Chemistry</i>	3	2	1
CHM4001	Kimia Perindustrian/ <i>Industrial Chemistry</i>	3	3	0
atau Komputer/ or Computer				
SSK3000	Teknologi Maklumat dan Penggunaannya/ <i>Information Technology and Its Applications</i>	3	2	1
SSK3100	Pengaturcaraan Komputer I/ <i>Computer Programming I</i>	4	3	1
SSK3101	Pengaturcaraan Komputer II/ <i>Computer Programming II</i>	4	3	1
atau Matematik/ or Mathematics				
MTH3100	Kalkulus/ <i>Calculus</i>	3	3	0
MTH3102	Persamaan Pembezaan/ <i>Differential Equations</i>	3	3	0
MTH3200	Aljabar/ <i>Algebra</i>	3	3	0
MTH3401	Kebarangkalian dan Statistik I/ <i>Probability and Statistics I</i>	3	3	0
atau Fizik/ or Physics				
PHY3103	Fizik I/ <i>Physics I</i>	4	3	1
PHY3104	Fizik III/ <i>Physics II</i>	4	3	1
PHY3401	Keelektromagnetan/ <i>Electromagnetism</i>	3	3	0
PHY3105	Fizik Moden/ <i>Modern Physics</i>	3	3	0





3. Kursus Pendidikan/ *Educational Courses* (38 Kredit/ *Credits*)

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept of Education</i>	2	2	0
FCE3200	Psikologi Pendidikan/ <i>Educational Psycology</i>	3	3	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1
FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
STE3502	Kaedah Mengajar Fizik/ <i>Physics Teaching Method</i>	3	2	1
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
STE3400/ STE3502/ STE3503/ STE3700/	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/ Fizik/ Kimia/ Sains Komputer dan Teknologi Maklumat)	3	2	1

Nota/ Notes : Kr = Jam Kredit/ Credit Hour, K = Kuliah/ Lecture, A = Amali/ Laboratory, T = Tutorial

Nota/Notes :

1. Pelajar diwajibkan memilih **2 kredit** daripada **kursus kokurikulum** yang ditawarkan oleh universiti/ It is **compulsory for students to take 2 credits of co-curriculum courses offered by the university**
2. Pelajar perlu melengkapkan pakej keperluan bahasa inggeris seperti jadual di bawah :
(Butiran lanjut mengenai CEL dan LAX sila rujuk di muka surat belakang buku panduan ini)
Students need to complete the english package as the table below : For more details on CEL and LAX please refer to the back/last page of this book.

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points



SKEMA PENGAJIAN/ STUDY SCHEME

TAHUN 1/ 1ST YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3002	Biologi Sel dan Molekul/ <i>Cell and Molecular Biology</i>	3	2	1
BGY3100	Biologi Mikroorganisma/ <i>Biology of Microorganisms</i>	3	2	1
CHM3201	Kimia Organik I/ <i>Organic Chemistry I</i>	4	3	1
PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2	2	0
SKP2203	Tamadun Islam dan Tamadun Asia/ <i>Islamic Civilization and Asian Civilization</i>	2	2	0
SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2	2	0
JUMLAH/ TOTAL		16	13	3

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3003	Biologi Perkembangan/ <i>Developmental Biology</i>	3	2	1
CHM3010	Kimia Fizik dan Tak Organik/ <i>Physical and Inorganic Chemistry</i>	4	3	1
SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3	3	0
BBI2423	<i>Academic Interaction and Presentation</i>	3	2	1
PHY2001	Fizik Am/ <i>General Physics</i>	4	3	1
JUMLAH/ TOTAL		17	13	4

*Pelajar disaran agar mendaftar satu kursus ko-kurikulum berkredit pada Semester 2 / *Students are adviced to register a co-curriculum course in Semester 2.*

TAHUN 2/ 2ND YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3101	Biodiversiti Mikroorganisma dan Tumbuhan/ <i>Microorganism and Plant Biodiversity</i>	4	3	1
BGY3102	Biodiversiti Haiwan/ <i>Animal Biodiversity</i>	4	3	1
BGY3201	Struktur dan Fungsi Tumbuhan/ <i>Plant Structure and Function</i>	3	2	1



BGY3401	Ekologi/ <i>Ecology</i>	3	2	1
BB12424	Academic Writing	3	2	1
JUMLAH/ TOTAL		17	12	5

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3202	Struktur dan Fungsi Haiwan/ <i>Animal Structure and Function</i>	3	2	1
BGY3301	Fisiologi Tumbuhan/ <i>Plant Physiology</i>	4	3	1
BGY3501	Genetik/ <i>Genetics</i>	4	3	1
BGY3701	Biostatistik/ <i>Biostatistics</i>	3	2	1
FCE3100	Falsafah Dan Konsep Pendidikan/ <i>Philosophy And Concept Of Education</i>	2	2	0
JUMLAH/ TOTAL		19	16	3

*Pelajar disarankan agar mendaftar satu kursus ko-kurikulum berkredit pada Semester 4 / *Students are advised to register a co-curriculum course in Semester 4.*

TAHUN 3/ 3RD YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY3302	Fisiologi Haiwan/ <i>Animal Physiology</i>	4	3	1
FSA3000	Falsafah Sains/ <i>Philosophy of Science</i>	2	2	0
FCE3200	Psikologi Pendidikan/ <i>Educational Psychology</i>	3	3	0
FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2	2	0
FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3	2	1
PHY/CHM/SSK// MTH	Subjek Kedua / <i>Second Subject</i>	3/4		
JUMLAH/ TOTAL		17/18	15/16	2

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY4999A	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
SKM2300	Pengenalan Kepada Multimedia/ <i>Introduction to Multimedia</i>	3	2	1
FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3	2	1





FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3	2	1
FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	2	2	0
PHY/CHM/SSK/ / MTH	Subjek Kedua / <i>Second Subject</i>	3/4		
JUMLAH/ TOTAL		17/18	11/12	6

TAHUN 4/ 4TH YEAR

SEMESTER 1/ 1ST SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
BGY4999B	Projek Ilmiah Tahun Akhir/ <i>Final Year Academic Project</i>	3	0	3
MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3	2	1
EMG3001	Manusia dan Alam Sekitar/ <i>Man and Environment</i>	3	3	0
PHY/ /SSK/ / MTH	Subjek Kedua / <i>Second Subject</i>	3/4		
JUMLAH/ TOTAL		12/13	5	4

SEMESTER 2/ 2ND SEMESTER

KOD KURSUS/ COURSE CODE	NAMA KURSUS/ COURSE NAME	Kr	K	A/T
STE3400/ STE3502/ STE3503/ STE3700/	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/ Fizik/ Kimia/ Sains Komputer dan Teknologi Maklumat)	3	2	1
FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice In Major Field</i>	4	0	4
FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4	0	4
STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3	2	1
FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3	2	1
JUMLAH/ TOTAL		17	6	11





SINOPSIS KURSUS/ COURSE SYNOPSIS

Jabatan Biologi/ Department of Biology

BGY2001 Konsep Biologi / *Biological Concept* 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi teori sel, aliran tenaga serta fisiologi tumbuhan dan haiwan. Konsep asas dan aplikasi genetik, pengelasan organisma dan ekologi juga dibincangkan.

This course covers cell theory, energy flow and plant and animal physiology. Basic concepts and the application of genetics, organisme classifications and ecology are also discussed.

BGY3002 Biologi Sel dan Molekul/ *Cell and Molecular Biology* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi ciri molekul yang membentuk sel dan asas kimianya, kaitan antara struktur komponen sel dan fungsinya, serta interaksi antara sel dengan sekitarnya. Aliran tenaga di dalam sel termasuk respirasi aerob dan fotosintesis, aliran maklumat yang meliputi struktur asas maklumat sel, ekspresi gen, replikasi dan pembaikpulihan DNA serta pembiakan sel dibincangkan. Pergerakan sel, transduksi isyarat dan beberapa teknik penting dalam kajian biologi sel dan molekul juga diberi penekanan.

This course covers the properties of molecules that form the cells and their chemical bases, the relationships between cell structural components and functions, and, also the interactions between cells and their environment. Energy flow in cells including aerobic respiration and photosynthesis, information flow which includes the structural basis of cellular information, gene expression, DNA replication and repair, as well as cell reproduction are discussed. Cell motility, signal transduction and several important techniques in cell and molecular biology are also emphasised.

BGY3003 Biologi Perkembangan/ *Developmental Biology* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi konsep, prinsip dan proses perkembangan sel pembiakan dalam perkembangan embrio tumbuhan dan haiwan. Corak perkembangan dan asas genetik dalam haiwan dan tumbuhan turut dibincangkan.

This course covers the concepts, principles and development processes of reproductive cells in plant and animal embryonic development. Pattern of development and basic genetics in animals and plants are also discussed.

BGY3100 Biologi Mikroorganisma/ *Biology of Microorganisms* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi diversiti, fisiologi, pembiakan dan genetik mikroorganisma. Kepentingan dan kegunaannya dalam bidang perubatan, pertanian, sains persekitaran dan industri makanan juga dibincangkan.

This course covers the diversity, physiology, reproduction and the genetics of microorganisms. The importance and the applications of the microorganisms in the fields of medicine, agriculture, environmental sciences and food industry are also discussed.

BGY3101 Biodiversiti Mikroorganisma dan Tumbuhan/
Microorganism and Plant Biodiversity 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi pengelasan moden Monera, Protista, Fungi dan Plantae dengan penekanan kepada kepelbagaian yang ditunjukkan oleh filum utama. Evolusi tumbuhan vaskular berasaskan penyesuaian kepada persekitaran daratan dan peningkatan kesempurnaan yang menghasilkan kedominan tumbuhan berbunga dibincangkan.





This course includes a modern classification of Monera, Protista, Fungi and Plantae with emphasis on the diversity encountered within the major phyla. The evolution of vascular plants in terms of adaptation to the terrestrial environment and increasing complexity which culminates in the dominance of the flowering plants are discussed.

BGY3102 Biodiversiti Haiwan/ *Animal Biodiversity* 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi kepelbagaian dan tinjauan filogeni berkaitan pengelasan haiwan. Ciri filum, kelas dan famili yang utama, morfologi, habitat dan taburannya (merujuk khas kepada spesies tempatan) diterangkan. Penekanan diberikan kepada pengelasan dan pengelasan invertebrat dan vertebrat akuatik dan terestrial yang mempunyai kepentingan ekonomi dan sumber makanan, termasuk isu pemuliharaan dan pembaikan genetik haiwan berpotensi ekonomi.

This course covers the diversity and phylogenetic survey related to the classification of animals. Characteristics of the main phylum, classes and families, morphology, habitat and distribution (with special reference to local species) are explained. Emphasis is given to the identification and classification of local aquatic and terrestrial invertebrates and vertebrates which have economic importance and food sources, including issues pertaining to conservation and genetic improvement of animals with economic potential.

BGY3201 Struktur dan Fungsi Tumbuhan/ *Plant Structure and Function* 3(2+1)

Prasyarat : BGY 3101

Kursus ini meliputi morfologi, anatomi, kepelbagaian dan fungsi sistem akar dan pucuk. Pertumbuhan primer dan skunder tumbuhan, penyesuaian organ, dan batang, penyesuaian organ tumbuhan. Perkembangan debunga dan pundi embrio, persenyawaan, pembentukan buah dan biji benih serta penyebarannya turut dibincangkan.

This course covers the diversity of the morphology and anatom, primary and secondary growth of the root and stem, and adaptation of plant organs. Development of pollen and embryo sac, fertilization, formation of fruit and seed, as well as dispersal are also discussed.

BGY3202 Struktur dan Fungsi Haiwan/ *Animal Structure and Function* 3(2+1)

Prasyarat : BGY 3102

Kursus ini merangkumi morfologi, anatomi dan fungsi pelbagai sel, tisu, organ dan sistem haiwan. Perkembangan filogeni organ dan sistem haiwan yang berhubungan dengan fungsi dan penyesuaian terhadap persekitarannya turut dibincangkan.

This course comprises the morphology, anatomy and functions of various animal cells, tissues, organs and systems. The phylogenetic development of animal organ and systems in relation to their function and adaptation to the environment is also discussed.

BGY3301 Fisiologi Tumbuhan/ *Plant Physiology* 4(3+1)

Prasyarat : BGY 3002

Kursus ini merangkumi konsep tenaga dan hubungkait dengan resapan, osmosis, pedapan, penyerapan dan pengangkutan air, transpirasi dan gutasi. Pemakanan mineral, aspek umum metabolisme tumbuhan, translokasi, biosintesis, kesan fisiologi hormon tumbuhan, fotomorfogenesis, fotoperiodisme, vernalisasi dan dormansi dibincangkan. Masalah fisiologi yang khusus bagi tumbuhan di kawasan tropika, fisiologi kepayahan dan penggunaan fisiologi tumbuhan dalam pertanian ditekankan.





This course encompasses the concept of energy and its relationship with diffusion, osmosis, imbibition, absorption and translocation of water, transpiration and guttation. Mineral nutrition, general aspects of plant metabolism, translocation, biosynthesis, the physiological effects of plant hormones, photomorphogenesis, photoperiodism, vernalization and dormancy are discussed. Specific problems in plant physiology in the tropics, stress physiology and applications of plant physiology in agriculture are emphasized.

BGY3302 Fisiologi Haiwan/ *Animal Physiology* 4(3+1)

Prasyarat : BGY 3202

Kursus ini merangkumi konsep homeostasis sebagai asas kepada semua fenomena fisiologi. Sistem komunikasi intersel dan sistem fisiologi juga dibincangkan.

The course comprises concept of homeostasis as a basis to all physiological phenomena. Intercellular communication and physiological system are also discussed.

BGY3401 Ekologi/ *Ecology* 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi komponen utama persekitaran; populasi, komuniti dan ekosistem dianalisis sebagai entiti dinamik. Pengeksploitan ekosistem, pencemaran dan pemantauan dibincangkan. Aspek teori dan fungsi dianalisis secara kualitatif dan kuantitatif. Pemulihan dan pemuliharaan ekosistem diperkenalkan. Amali dan kerjalapangan menekankan asas kuantitatif ekologi, pensampelan dan analisis populasi.

This course encompasses major components of the environment; population, community and ecosystem are analyzed as dynamic entities. Ecosystem exploitation, pollution and monitoring are discussed. Theoretical and functional aspects are analyzed qualitatively and quantitatively. Restoration and conservation of ecosystems are introduced. Practical and field work emphasize the quantitative basis of ecology, sampling and population analysis.

BGY3501 Genetik/ *Genetics* 4(3+1)

Prasyarat : BGY 3002

Kursus ini merangkumi pelbagai konsep genetik, genetik Mendel, sitogenetik, pewarisan sitoplasma, genetik biokimia, molekul, mikrob, populasi dan kuantitatif. Variasi protein dan DNA, teknologi DNA rekombinan, kejuruteraan genetik dan pembiakbakaan ditekankan. Peranan genetik dalam perubatan, pemuliharaan biodiversiti dan biosumber dibincangkan.

This course covers various genetic concepts, Mendelian genetics, cytogenetics, cytoplasmic inheritance, biochemical, molecular, microbial, population and quantitative genetics. Protein and DNA variations, DNA recombinant technology, genetic engineering and breeding are emphasised. The roles of genetics in medicine, biodiversity and bioresources conservation are discussed.

BGY3701 Biostatistik/ *Biostatistics* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi rekabentuk eksperimen dan kaedah analisis data biologi. Statistik diskriptif, perbandingan min, korelasi, ujian c^2 , regresi, tafsiran dan pembentangan keputusan dibincangkan.

This course encompasses experimental design and methods of biological data analysis. Descriptive statistics, comparison of means, correlation, c^2 -test, regression, interpretation and presentation of results are discussed.





BGY4101 Mikologi/ Mycology

4(3+1)

Prasyarat : BGY 3101

Kursus ini meliputi struktur sel dan pembentukan propagul pembiakan kulat, pengeluaran, penyebaran dan percambahan spora serta pengelasan kulat. Interaksi spesies dan peranan kulat dalam kitaran nutrien, bioteknologi dan perindustrian dibincangkan.

This course covers the cell structure and development of reproductive propagules of fungi, production, dispersal and germination of spores as well as fungal classification. Species interaction and the role of fungi in nutrient cycle, biotechnology and industries are discussed.

BGY4102 Kimotaksonomi Tumbuhan/ Plant Chemotaxonomy

3(2+1)

Prasyarat : BGY3101 dan BGY3201

Kursus ini merangkumi pengetahuan semasa mengenai komposisi sebatian kimia semulajadi dalam takson tumbuhan. Taburan, kepelbagaian struktur, kepentingan ekonomi dan peranan sebatian kimia tersebut dalam evolusi di pelbagai peringkat taksonomi tumbuhan dibincangkan.

The course comprises current knowledge on the chemical composition of plant taxa. Distribution, function, diversity of structure, economic importance and the role chemical compounds in evolution of various stages of plant taxonomy are discussed.

BGY4105 Fikologi/ Phycology

3(2+1)

Prasyarat : BGY3101

Kursus ini merangkumi definisi dan pengelasan alga, morfologi, perkembangan fikologi, kepentingan dan kegunaan alga, kaedah pembiakan dan kitaran hidup, fisiologi dan ekologi alga.

This course covers the definition and classification of algae, morphology, development of phycology, importance and uses of algae, method of reproduction and life cycle, physiology and algal ecology.

BGY4106 Biologi Organisma Akuatik Komersil/ Biology Of Commercial Aquatic Organisms

4(3+1)

Prasyarat : BGY3102

Kursus ini merangkumi kepelbagaian organisma akuatik yang penting dari segi komersial. Morfologi dan anatomi, sistem pencernaan, pembiakan, peredaran darah, pernafasan, osmokawalan, pewarnaan, deria dan endokrin pelbagai kumpulan organisma akuatik dibincangkan. Perhubungan organisma akuatik dengan persekitaran termasuk tabiat makan, strategi pembiakan, adaptasi dan osmokawalan ditekankan. Kepelbagaian genetik, sejarah evolusi, filogenetik dan biogeografi organisma akuatik komersial terpilih diterangkan.

This course covers the diversity of commercially important aquatic organisms. The morphology and anatomy, digestive, reproductive, circulatory, respiratory, osmoregulatory, colouration, sensory and endocrine systems in various groups of aquatic organisms are discussed. Ecological relationships between aquatic organisms and their environments including feeding habits, reproduction, adaptation and osmoregulation are emphasised. Genetic diversity, evolutionary history, phylogenetic and biogeography of the selected commercially important aquatic organisms are explained.





BGY4401 Ekologi Hutan Tropika/ *Tropical Forest Ecology* 4(3+1)

Prasyarat : BGY3101 dan BGY3401

Kursus ini merangkumi persekitaran, iklim dan mikroiklim, struktur, fungsi, biodiversiti dan komponen pelbagai jenis hutan tropika. Pensampelan, penzonan, kekalaaan, fenologi, sebaran biji benih, percambahan, regenerasi, penguraian dan sesaran dibincangkan. Kesan aktiviti manusia dan pemuliharaan hutan ditekankan.

This course covers environment, climate and microclimate, structure, functions, biodiversity and components of various types of tropical forests. Sampling, zonation, periodism, phenology, seed dispersal, germination, regeneration, decomposition and succession are discussed. Impact of human activities and forest conservation are emphasized.

BGY4402 Ekologi Hidupan Liar/ *Wildlife Ecology* 4(3+1)

Prasyarat : BGY3102 dan BGY3401

Kursus ini merangkumi konsep dan ekologi hidupan liar. Aspek pencarian makanan, persaingan, pemangsa, pembiakan, penjagaan anak, pembelajaran, komunikasi intraspesies dan penghijrahan hidupan liar pelbagai ekosistem ditekankan. Penentuan kepadatan hidupan liar, aspek ekologi dalam pemuliharaan haiwan di kepulauan hutan, taman negara dan taman laut di Malaysia dibincangkan.

This course covers the concepts of wildlife and their ecology. Aspects of foraging, competition, predation, reproduction, caring of young, learning, intraspecific communication and migration of wildlife in various ecosystems are emphasised. Wildlife density estimation, ecological aspects in the conservation of wildlife in forest islands, national and marine parks in Malaysia are discussed.

BGY4403 Ekotoksikologi/ *Ecotoxicology* 4(3+1)

Prasyarat : BGY3401

Kursus ini merangkumi sumber dan kimia bahan toksik. Pengekstrakan, pengesanan, biocerakan dan tindakbalas organisma terhadap bahan toksik dibincangkan. Kesan bahan toksik terhadap organisma, populasi dan komuniti di pelbagai ekosistem ditekankan. Biopenyerapan, biopemindahan, biopenguraian, peranan tanah dan sedimen terhadap bahan toksik, pemantauan dan kawalan bahan toksik, aspek piawaian dan keselamatan persekitaran dibincangkan.

This course covers the source and chemistry of toxicants. Extraction, detection, bioassay and response of organisms towards toxicants are discussed. Effects of toxicants on the organisms, populations and communities in various ecosystems are emphasized. Bioabsorption, bioaccumulation, biotransfer, biodegradation, the role of soil and sediment towards toxicants, monitoring and control of toxicants and aspects of standard and environmental protection are discussed.

BGY4404 Limnologi Dan Oseanografi/ *Limnology And Oceanography* 4(3+1)

Prasyarat : BGY3401

Kursus ini merangkumi asal usul jasad air, ciri morfometri, keseimbangan air, kitaran hidrologi, perbezaan air laut, air payau dan air tawar; lotik dan lentik, sifat fizik dan kimia air, bahan terlarut dan partikel, edaran air, dan stratifikasi dibincangkan. Penggunaan air dalam pengangkutan, struktur adaptasi organisma, produktiviti primer dan sekunder dan organisma pengurai ditekankan. Perubahan bermusim, enapan dan pengenapan, stratifikasi mikro, kesan aktiviti manusia ke atas sistem akuatik dan perkembangan semasa dalam bidang limnologi dan biologi marin diberi penekanan.





This course encompasses the origin of water bodies, morphometric features, water balance, hydrological cycle, differences in marine, brackish and freshwater, lotic and lentic, physical and chemical properties, dissolved and particulate substances, water circulation, and stratification are discussed. The use of waters in transportation, adaptive features of organisms, primary and secondary productivity, and decomposers are emphasized. Seasonal variations, sediment and sedimentation; microstratification, impact of man on aquatic system, and recent development in the field of limnology and marine biology are highlighted.

BGY4406 Biologi Dan Ekologi Rumput Laut/ *Biology And Ecology Of Seagrasses* 4(3+1)

Prasyarat : Tiada

Kursus ini merangkumi pengenalan, anatomi, taksonomi dan kepelbagaian spesies rumput laut. Teknik pensampelan, pengecaman, pengawetan dan penyediaan herbarium dijalankan. Taburan dan biogeografi rumput laut berkaitan dengan habitat persisiran pantai, paya bakau dan terumbu karang, ciri penyesuaian hidup kepada persekitaran marin, pertumbuhan, produktiviti dan faktor utama yang mengawalinya dibincangkan. Biologi pembiakan rumput laut pilihan, fungsi, kegunaan dan ancaman terhadap rumput laut ditekankan.

This course covers the introduction, anatomy, taxonomy and species diversity of seagrasses. Sampling techniques, identification, preservation and herbarium preparation are carried out. Distribution and biogeography of seagrasses in relation to inshore tidal habitats, mangroves and coral reefs, adaptive characteristics to marine environment, growth, productivity and primary factors controlling them are discussed. Reproductive biology of selected seagrasses, their functions and uses, and threats to seagrasses are emphasised.

BGY4407 Pengurusan Ekosistem Akuatik/ *Aquatic Ecosystem Management* 4(4+0)

Prasyarat : BGY3401

Kursus ini merangkumi organisasi struktur ekosistem tasik, sungai, empangan, muara dan laut. Pengaliran tenaga dan kitaran nutrien melalui populasi dan komuniti, ekosistem akuatik sebagai pengeluar sumber mapan, pencemaran dan ancaman terhadap kelestarian sumber akuatik, teknik pemulihan, strategi pembangunan dan pengurusan mapan ekosistem akuatik dibincangkan.

This course covers the structural organization of lake, river, reservoir, estuary and marine ecosystems. Energy flow and nutrient cycling through populations and communities, aquatic ecosystems as sustainable resource generators, pollution and threats to the sustainability of aquatic resources, remedial techniques, strategies for sustainable development and management of aquatic ecosystem are discussed.

BGY4408 Limnologi Gunaan/ *Applied Limnology* 4(3+1)

Prasyarat : BGY3401

Kursus ini merangkumi aras trofik sistem akuatik dan faktor yang mempengaruhi perubahannya. Peranan fosforus, nitrogen dan karbon dalam eutrofikasi dan penentuan aras produktiviti dibincangkan. Penggunaan ekoteknologi dan biomanipulasi dalam pemulihan ekosistem tercemar, pengawalan eutrofikasi, pemuliharaan ekosistem, dan peningkatan pengeluaran akuatik, pengurusan sistem akuatik air tawar berasaskan pengawalaturan faktor fizik, kimia dan biologi ditekankan.

This course covers the trophic levels of aquatic systems and factors controlling their changes. Roles of phosphorus, nitrogen and carbon in eutrophication and determination of productivity levels are discussed. Use of ecotechnology and biomanipulation techniques in recovering polluted ecosystems, eutrophication control, ecosystem conservation and increase of aquatic production, management of inland aquatic systems based on regulation of physical, chemical and biological factors are emphasized.





BGY4501 Polimorfisme Genetik/ *Genetic Polymorphisms* 4(3+1)

Prasyarat : BGY3501

Kursus ini merangkumi asas genetik dalam variasi di tahap polimorfisme dan kaitannya dengan kehidupan serta kepentingannya dalam evolusi. Teknik mengesan pelbagai bentuk dan kegunaan polimorfisme dalam perubatan, pertanian, biosistematik, pemuliharaan, evolusi, antropologi dan forensik dibincangkan. Polimorfisme morfologi, kromosom, seks, biokimia, enzim, isoenzim, aloenzim, elektromorf, molekul, DNA nukleus, jujukan DNA, polimorfisme serpihan pembatasan DNA, satelit DNA, DNA mitokondria, DNA plastid dan gerak balas individu terhadap ubatan dibincangkan.

This course covers the genetic basis of variation found at polymorphic levels and their relevance to life as well as their significance in evolution. Techniques to type the various forms and the use of polymorphisms in medicine, agriculture, biosystematics, conservation, evolution, anthropology and forensics are discussed. Polymorphisms in terms of morphology, chromosome, sex, biochemistry, enzyme, isoenzyme, alloenzyme, electromorph, molecule, nuclear DNA, DNA sequence, DNA restriction fragment length polymorphisms, DNA satellite, mitochondrial DNA, plastid DNA and the response of individuals to medicine are discussed.

BGY4502 Genetik dan Pembiakbakaan Organisma Akuatik/ *Genetics and Breeding of Aquatic Organisms* 4(3+1)

Prasyarat : BGY3501

Kursus ini merangkumi prinsip genetik termasuk sitogenetik, genetik kualitatif dan kuantitatif serta prinsip pembiakbakaan semulajadi dan aruhan. Program pemilihan dan teknik manipulasi kromosom dalam organisma akuatik terpilih dibincangkan.

This course covers the principles of genetics including cytogenetics, qualitative and quantitative genetics and principles of natural and induced breeding. Selection programme and chromosome manipulation techniques in selected aquatic organisms are discussed.

BGY4503 Biologi Pembiakan Bandingan/ *Comparative Reproductive Biology* 4(3+1)

Prasyarat : BGY3102

Kursus ini merangkumi prinsip biologi pembiakan secara bandingan bagi kumpulan vertebrat utama. Penggunaan kaedah cerapan kuantitatif, histologi dan mikroskop elektron dalam pemerhatian dan pengenalpastian peringkat perkembangan gonad dan embrio dijalankan.

This course covers principles of comparative reproductive biology of major groups of vertebrate. The use of various quantitative and histological methods and electron microscopy to describe, observe and identify the developmental stages of gonad and embryo are carried out.

BGY4504 Genetik Populasi/ *Population Genetics* 4(3+1)

Prasyarat : BGY3501

Kursus ini merangkumi analisis genetik populasi, keseimbangan Hardy-Weinberg, mutasi dan kadar mutasi, pengekal polimorfisme, pemilihan dan hanyutan gen, proses pemilihan, genetik populasi dan evolusi.

This course covers population genetic analysis, the Hardy-Weinberg equilibrium, mutation and mutation rates, maintenance of polymorphisms, selection and genetic drift, selection processes, population genetics and evolution.





BGY4505 Genetik Kuantitatif/ *Quantitative Genetics* 4(3+1)

Prasyarat : BGY3501

Kursus ini merangkumi konsep genetik populasi dan genetik kuantitatif termasuk kajian variasi genetik dan bukan genetik dalam populasi, statistik diskriptif, konsep heritabiliti, pemilihan dan kemajuan genetik, dan analisis biometrik bagi kacukan dwialel.

This course covers concepts of population genetics and quantitative genetics including the study of genetic and non-genetic variation in populations, descriptive statistics, concept of heritability, selection and genetic progress and biometrical analysis of diallel crosses.

BGY4801 Teknik Pengasingan Dan Penulenan Dalam Analisis Protein/ 3(2+1)
Separation And Purification Techniques In Protein Analysis

Prasyarat : BGY3002

kursus ini merangkumi konsep analisis kromatografi dan elektroforesis. teknik kromatografi penukaran ion, kromatografi, pengfokusan, penurasan gel, analisis elektroforesis dan pemfokusan isoelektrik dibincangkan.

The course covers the analytical concept of chromatography and electrophoresis. The ionic exchange chromatography, chromatofocusing, gel filtration, electrophoresis and isoelectric focusing techniques are discussed.

BGY4901 Latihan Industri/ *Industrial Training* 4 (0+4)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini meliputi latihan industri selama 8 minggu di agensi kerajaan atau beberapa syarikat atau kilang industri yang terpilih. Latihan dikendalikan bersama oleh penyelaras dan seorang penyelia atau pengurus dari agensi atau syarikat atau kilang tersebut.

This course covers an industrial training for a period of 8 weeks at various selected government agencies, companies or factories. The training is organized jointly by the coordinator and supervisor or the manager from the related agencies, company or factory.

BGY4999 Projek Ilmiah Tahun Akhir/ *Final Year Academic Project* 6 (0+6)

Prasyarat : Pelajar Tahun Akhir Major Biologi

Kursus ini merangkumi sorotan bahan rujukan, penggunaan teknik penyelidikan yang sesuai, pengumpulan dan analisis data, penafsiran keputusan, perbincangan dan kesimpulan kajian saintifik dalam projek penyelidikan atau projek multimedia.

This course covers literature review, use of appropriate research techniques, data collection and analyses, interpretation of results, discussion and conclusion of scientific studies in research or multimedia project.





Jabatan Fizik/ Department of Physics

PHY2001 Fizik Am/ General Physics 4(3+1)

Prasyarat : Tiada

Kursus ini menerangkan idea dan prinsip fizik yang utama merangkumi mekanik, sifat jirim, haba, fenomena gelombang, keelektrikan dan kemagnetan, dan optik. Perbincangan dijalankan secara kualitatif dengan penggunaan kalkulus yang minimum. Penggunaan idea dan prinsip dalam sains guna turut diberi penekanan.

This course explains the principal ideas of physics covering mechanics, properties of matter, heat, wave phenomena, electricity and magnetism, and optics. Discussion is done qualitatively with minimum use of calculus. Application of the above ideas and principles to applied is also emphasized.

PHY3103 Fizik I/ Physics I 4(3+1)

Prasyarat : Tiada

Kursus ini merangkumi pergerakan sistem zarah dan jasad tegar dalam satu, dua dan tiga dimensi dengan menggunakan Mekanik Newton. Dinamik getaran zarah dan jasad tegar serta Hukum Termodinamik dan aplikasinya dalam fizik terma dibincangkan.

This course covers the motion of system of particles, and rigid bodies in one, two and three dimensions using Newtonian Mechanics. Dynamics of oscillating particles and rigid bodies, and laws of thermodynamics and their applications in thermal physics are discussed.

PHY3104 Fizik II/ Physics II 4(3+1)

Prasyarat : Tiada

Kursus ini merangkumi keelektrikan dan kemagnetan. Persamaan Maxwell dan penjanaan dan Perambatan Gelombang Elektromagnet juga dibincangkan. Prinsip Huygen dan Optik Geometri, topik dalam optik fizikal termasuk Superposisi gelombang, pembelauan dan Interferen akan diliputi.

This course covers electricity and magnetism. The Maxwell's equations and generation and propagation of electromagnetic waves are discussed. Huygen's principle, geometrical optics, and topics in physical optics including superposition of waves, diffraction and interference are covered.

PHY3105 Fizik Moden/ Modern Physics 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi tajuk asas dalam fizik moden termasuk teori kerelatifan, sinaran jasad hitam dan asas fizik kuantum. Struktur atom dan nukleus, keradioaktifan dan tindak balas nuklear, zarah asas dan kosmologi dibincangkan.

This course covers fundamental topics in modern physics including theories on relativity, black body radiation and basic quantum physics. The structure of atom and nucleus, radioactivity and nuclear reaction, elementary particles and cosmology are discussed.

PHY3201 Fizik Keadaan Pepejal/ Solid States Physics 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi struktur dan daya ikatan hablur. Getaran kekisi dan kesannya ke atas sifat terma, akustik dan optik tentang model elektron bebas dalam logam dibincangkan. Perlakuan realistik tentang elektron dalam Model Jalur digunakan untuk membezakan semikonduktor, penebat dan logam, sifat dielektrik, optik, dan magnet serta kecacatan dalam logam ditekankan.





This course covers crystal structure and crystal binding forces. Lattice vibration and its effect on thermal, acoustic and optical properties of free electron model in metals are discussed. Realistic behaviour of these electrons in the Band Mode is employed to distinguish semiconductor, insulator and metals, dielectric, optical, magnetic properties and defects in solid are emphasized.

PHY3208 Kemagnetan dan Bahan Magnet/ *Magnetism and Magnetic Materials* 3(3+0)

Prasyarat : PHY3201

Kursus ini merangkumi aspek kemagnetan intrinsik dan teknikal. Kuantum mekanik berserta gambaran kemagnetan atom digunakan untuk memberi penjelasan tentang asal dan tabiat sifat magnet. Resonans magnet dan kemagnetan domain dibincangkan. Teknik pengukuran medan magnet, sifat magnet, kegunaan bahan magnet dalam peranti dan kemajuan baru dibincangkan.

The course covers the intrinsic and technical aspects of magnetism. Quantum mechanics and the atomic picture of magnetism are used to explain the origin and behaviour of magnetic properties. Magnetic resonance and domain magnetism are discussed. Techniques for measuring magnetic fields and magnetic properties, applications of magnetic materials in devices and new advances are discussed.

PHY3301 Elektronik Analog/ *Analog Electronics* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi teknik analisis litar AC dan DC, litar sumber kuasa, penapis, pengayun dan litar rektifier. Topik berkaitan ciri BJT, FET, transistor sebagai amplifer, litar sepadu dan amplifer operasi turut dibincangkan.

This course encompasses techniques of AC and DC analysis, power supply circuits, filters, oscillators and rectifier circuits. Topics on properties of BJT, FET, transistors as amplifier, integrated circuits and operational amplifier are discussed.

PHY3302 Elektronik Berdigit/ *Digital Electronics* 3(2+1)

Prasyarat : Tiada

Kursus ini merangkumi konsep asas dan kaedah elektronik berdigit. Ia merangkumi nama aljabar Boolean, teorem De Morgan, Peta Karnaugh, pintu logik, litar aritmetik, flip-flop, pembilang, pengkod dan pengnyah kod, pendaftar anjak, pengubah A/D dan D/A, pengenalan kepada sistem berasaskan mikroprosesor. Penuntut diperlukan mengambil kerja amali yang berkaitan dengan nama yang dibincangkan dalam kuliah.

This course covers the fundamental concepts and methods of digital electronics. Boolean algebra, De Morgan Theorem, Karnaugh Map, logic gates, arithmetic circuits, flip-flops, counters, coder and decoder, shift register, A/D and D/A converters, introduction to microprocessor based system are also discussed.

PHY3303 Sensor dan Transduser/ *Sensors and Transducers* 4(3+1)

Prasyarat : PHY3301

Kursus ini membincangkan tentang prinsip dan sifat fizik bagi pelbagai jenis sensor dan transduser yang utama. Seterusnya pelajar akan didedahkan dengan parameter sensor dan permodelan sesuatu sensor. Ini diikuti dengan pengajian pelbagai jenis sensor yang telah digolongkan mengikut kriteria elektronik seperti sensor resistif, reaktif, elektromagnet dan sensor swa-penjana. Pengenalan kepada pelbagai jenis sensor yang baru seperti sensor berdigit, sensor gentian optik, sensor berasaskan peranti semikonduktor dan sensor ultrasonik juga akan dibincang. Bahagian akhir kursus ini adalah berkaitan dengan penggunaan sensor dalam proses pengeluaran automatik dan kawalan pemprosesan.





This course discusses the principles dan physical properties of the most important types of sensors and transducers. Consequently the student is exposed to the sensor parameters and sensor modeling. This is followed by the study of various types of sensors which have been grouped according to electronic criterion namely resistive sensor, reactance sensor, electromagnetic sensor and self-generator sensor. Recent developments in sensor fields such as digital sensor, optical fiber sensor, sensor based on semiconductor devices and ultra-sonic sensor are also discussed. The final part deals with the applications of sensor in automated production and process control.

PHY3304 Prinsip Sistem Pengukuran/ *Principle of Measurement* 4(3+1)
System

Prasyarat : PHY3101 & PHY3102

Kursus ini merangkumi aspek-aspek umum mengenai sistem pengukuran yang berkaitan dengan ciri-ciri statik dan dinamik yang dimiliki oleh setiap unsur pengukuran dan kesannya ke atas kejutuan keseluruhan sistem. Seterusnya kesan beban, hingar dan gangguan ke atas prestasi sistem akan juga dibincang. Penekanan dalam kursus ini adalah dalam pengajian prinsip dan ciri unsur-unsur pengukuran yaitu sensor, pembentukan isyarat, pemprosesan isyarat dan penyajian data. Bahagian akhir kursus ini membicarakan pelbagai contoh sistem pengukuran dalam industri dan makmal penyelidikan.

This course covers general aspects of measurement system such as static and dynamic characteristics that individual elements may possess and how they affect the accuracy of the overall system. The effects of loading, noise and interference on system performance are also discussed. The course will stress on the principles and characteristics of typical sensing signal conditioning, signal processing and data presentation elements. Finally, a number of specialised measurement systems in the industry and research laboratory are discussed.

PHY3305 Instrumentasi Pengenalan/ *Introductory Instrumentation* 3(3+0)
Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi konsep dan falsafah pengukuran bagi kuantiti fizik asas, teknik penyelidikan fizik dan kegunaan peralatan saintifik yang sesuai didedahkan. Statistik pengukuran, transduser, sistem instrumentasi, elektronik, optik, laser dan penggunaan optik fiber dalam sistem pengukuran, ultrasonik dan spektrofotometri dibincangkan.

This course covers the concept and the philosophy of measurement of fundamental physical quantities. Various research techniques in physics and the use of appropriate scientific instruments are exposed. Measurement statistics, transducers, instrumentation systems, electronics, optics, laser, fibre optics in measurement systems, ultrasonic and spectrophotometry are discussed.

PHY3401 Keelektromagnetan/ *Electromagnetism* 3(3+0)
Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi hukum asas dan saling tindakan sistem elektrostatik yang membawa kepada kaedah penyelesaian persamaan-persamaan Poisson dan Laplace, kaedah imej bagi pengiraan medan elektrik, tenaga dan keupayaan elektrostatik dalam vakum dan dalam dielektrik. Saling tindakan magnet seperti yang dirumuskan dalam Hukum Biot-Savart dan Hukum Faraday, ciri magnet bahan, persamaan gelombang elektromagnet (EM) dalam media pengkonduksi dan bukan pengkonduksi dibincangkan.

This course covers basic laws and interactions of electrostatic systems leading to the use of solutions to Poisson and Laplace equations, image method in determining electric fields, electrostatic energy and potentials in vacuum and in dielectrics. The magnetic interactions as summarized in the Laws of Faraday and Biot-Savart, magnetic properties of matter, electromagnetic wave equation in conducting and non conducting media are discussed.





PHY3601 Mekanik Kuantum/ *Quantum Mechanics* 3(3+0)

Prasyarat : Tiada

Kursus ini merangkumi teori kuantum, penggunaan persamaan Schrodinger kepada sistem-sistem mudah satu, dua dan tiga dimensi, seperti pengayun harmonik, daya pusat dan atom hidrogen. Keformalan operator dititikberatkan. Ini termasuk operator, fungsi eigen dan nilai eigen bagi momentum sudut serta perwakilan matriksnya.

This course covers quantum theory, application of Schrodinger equation to simple systems in one, two and three dimensions such as harmonic oscillators, central forces and hydrogen atom. The operator formalism is also emphasized. This includes the operator, eigen functions and eigen values of angular momentum and their matrix representations.

PHY3602 Mekanik Statistik/ *Statistical Mechanics* 3(3+0)

Prasyarat : Tiada

Kursus ini merangkumi sifat cirian sistem makroskopik dan kaitannya dengan sifat statistik sistem zarah. Teori mikroskopik dan pengukuran makroskopik, taburan berkanun, saling tindakan termodinamik secara am, pengenalan teori kinetik bagi gas unggul dan sistem zarah yang serupa dibincangkan.

This course covers the characteristic features of macroscopic systems and their relation to statistical behaviour of systems of particles. Microscopic theory and macroscopic measurements, canonical distribution, general thermodynamic interactions, elementary kinetic theory of ideal gas and other similar particles are discussed.

PHY3603 Mekanik Klasik/ *Classical Mechanics* 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi pergerakan satu zarah dalam satu, dua dan tiga dimensi, pergerakan sistem zarah jasad tegar, putaran pada sebuah paksi, statik, kegravitian dan sistem koordinat bergerak. Mekanik Lagrange dan Hamilton, teori kerelatifan khas, transformasi Lorentz dan hukum keabadian kerelatifan dibincangkan.

This course covers the motion of a particle in one, two and three dimensions, the motion of a system of particles, rigid bodies, rotation about an axis, static, gravitation and moving coordinates systems. Lagrangian and Hamiltonian mechanics, special theory of relativity, the Lorentz transformation and the relativistic conservation laws are discussed.

PHY3604 Kaedah Matematik dalam Fizik/ *Mathematical Methods in Physics* 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi teknik matematik asas seperti ruang vektor, siri kuasa, aljabar vektor, matriks, siri Fourier dan analisis kompleks. Penyelesaian kepada persamaan pembezaan dan pembezaan separa, jelmaan Fourier, jelmaan Laplace, fungsi Dirac Delta dan fungsi Green dibincangkan.

This course covers basic mathematical techniques such as vector space, power series, vector algebra, matrices, Fourier series and complex analysis. Solutions of differential and partial differential equations, Fourier transformation, Laplace transformation, Dirac Delta function and Green function are discussed.





PHY4201 Fizik Keadaan Pepejal Lanjutan/ *Advanced Solid State Physics* 3(3+0)

Prasyarat : PHY3201

Kursus ini meliputi akibat struktur kekisi berkala ke atas getaran kekisi dan spektrum tenaga elektron, di samping menekankan peranan kecacatan hablur dan pengkutuban intrinsik. Aspek-aspek ini menjadi asas kepada sebahagian sifat dan saling tindakan yang melibatkan entiti hablur dan peransang luar dalam sistem logam, semikonduktor, penebat dan superkonduktor.

This course covers the consequences of a periodic lattice for allowed lattice vibrations and for the spectrum of electronic energy states, the course also highlights the role of crystal defects and intrinsic polarisations. These underlie, where appropriate, the discussed properties and interactions involving crystal entities and external stimuli in metallic, semiconducting, insulating and superconducting systems.

PHY4202 Peranti Semikonduktor/ *Semiconductor Devices* 3(3+0)

Prasyarat : PHY3103 dan PHY3301

Kursus ini merangkumi pendekatan sepadu dalam subjek peranti semikonduktor merangkumi tiga bidang utama: fizik keadaan pepejal, teori kuantum dan elektronik. Peranti daripada jenis sempadan p-n ke jenis yang lebih kompleks dibincangkan. Mekanisme pengkonduksian, ciri, perjalanan dan penggunaan peranti laser semikonduktor dan kesan sinaran laser ke atas semikonduktor ditekankan.

This course covers an integrated approach to the subject of semiconductor devices and covers three primary fields: solid state physics, quantum theory and electronics. The p-n junction device to those of more complex types is considered. Conduction mechanism, characteristics, operation and application of devices, semiconductor lasers and the effect of laser radiation on semiconductors are emphasized.

PHY4203 Sains Bahan/ *Materials Science* 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merangkumi pengelasan jenis bahan seperti logam, seramik dan kaca, polimer dan komposit. Gambarajah fasa bagi sistem dedua, penghabluran dan struktur mikro, kajian gambarajah fasa Fe-C antara muka dalam bahan ditekankan. Ketaksempurnaan dan sifat-sifat mekanik bahan dibincangkan.

This course covers the classification of types of materials such as metals, ceramics and glass, polymers and composites. Phase diagrams of binary systems, crystallization and microstructures, the study of the Fe-C phase diagram and interphases in materials are emphasized. Imperfections and mechanical properties of materials are discussed.

PHY4204 Kaedah Analisis Struktur dan Mikrostruktur/ *Analytical Methods of Structure and Microstructure* 4(3+1)

Prasyarat : PHY3201

Kursus ini melanjutkan perbincangan dalam kursus pengenalan Fizik Keadaan Pepejal (PHY 3201). Tajuk-tajuk yang dibincangkan termasuklah geometri dan simetri hablur, sifat-sifat sinar-x, neutron dan elektron, teori am belauan hablur, serakan sinar-x, elektron dan neutron, kajian ujukaji belauan sinar-x sesuatu hablur, struktur unsur dan suatu bahan pilihan.

This course complements the PHY 3201 course. Among the topics discussed are crystallographic geometry and symmetry, properties of x-rays, neutrons and electrons, general theory of diffraction, experimental study of diffraction by crystals, the structure of the elements and a specific material.





PHY4205 Seramik dan Polimer/ *Ceramics and Polymer* 4(3+1)

Prasyarat : PHY3201

Kursus ini merangkumi pengkelasan bahan yang terdiri daripada seramik, kaca, polimer dan komposit. Penekanan diberi kepada gambarajah fasa-fasa sistem dudua, penghabluran dan mikrostruktur kajian gambarajah fasa. Ini diikuti dengan perbincangan mengenai ketaksempurnaan canggaan linear dan tak linear dan sifat-sifat mekanik bahan tersebut.

This course deals with the classification of types of materials such as ceramics and glass, polymers and composites. Emphasis is given to phase diagrams of binary systems, crystallization and microstructures, the study of phase diagrams in such materials. This is followed by the study of imperfections linear and non linear deformation and mechanical properties of those materials.

PHY4206 Logam dan Alooi/ *Metals and Alloys* 4(3+1)

Prasyarat : PHY3201

Kursus ini membincangkan pengelasan jenis-jenis bahan logam, aloi besi dan bukan besi. Penekanan diberi kepada gambarajah fasa bagi sistem dedua, penghabluran dan struktur mikro, kajian gambarajah fasa Fe-C antara muka dalam bahan, kesan rawatan haba dan pengaloiian. Ini diikuti dengan perbincangan mengenai ketaksempurnaan dan sifat-sifat mekanik, optic, dielektrik dan magnet bahan. Kesan kakisan dan kaedah kawalan juga dibincangkan.

This course deals with the classification of types of metals, ferrous and nonferrous alloys. Emphasis is given to phase diagrams of binary systems, crystallization and microstructures, the study of Fe-C phase diagram and interphases in material, effect of heat treatment and alloying. This is followed by the study of imperfections, mechanical, optical, dielectric and magnetic properties. Effect of corrosion and its control are also discussed.

PHY4207 Teknologi Pemprosesan Bahan/ *Materials Processing Technology* 3(3+0)

Prasyarat : PHY3201

Kursus membincangkan mengenai pencirian dan sifat-sifat bahan, kaedah dan teknik-teknik pemprosesan, dan kaedah membentuk dalam pembuatan produk berasaskan bahan logam, seramik, polimer dan komposit. Di antara topik-topik yang akan dibincangkan ialah peleburan, pencampuran dan penyediaan serbuk, menekan, penerobosan, acuan injeksi, pensinteran dan memesis juga dibincangkan.

The course covers the characterisation, nature and properties, methods and techniques of processing and shaping methods for making products based on metals, ceramics, polymers and composites. Melting, mixing and powder preparation, pressing, casting, extrusion, injection moulding, sintering and machining are also discussed.

PHY4301 Mikroprosesor & Mikrokomputer/ *Microprocessor and microcomputer* 3(3+0)

Prasyarat : PHY3301 dan PHY3302

Kursus ini memperkenalkan rekabentuk mikrokomputer dan mikroprosesor. Perkakasan mikrokomputer seperti mikroprosesor 8088, alat ingatan dan peranti periferal dibincangkan. Teknik-teknik perisian bagi memahami carakkerja mikrokomputer, teknik antaramuka dan perbandingan mikroprosesor juga akan dibincangkan. Pelajar juga dikehendaki membuat projek kecil.

This course covers microcomputer and microprocessor architecture. Microcomputer hardware such as microprocessor 8088, memory and peripheral devices are discussed. Software techniques for understanding microcomputers, interfacing techniques and comparison of microprocessors are also discussed. Students are also required to carry out a mini project.





PHY4302 Rekabentuk Peralatan Elektronik/ *Design of Electronic Equipment* 4(3+1)

Prasyarat : PHY3301 dan PHY3302

Kursus ini merangkumi pelbagai peringkat aktiviti rekabentuk elektronik yaitu perancangan rekabentuk, lukisan, eksperimen, prototaip, pengujian, 'trouble shooting' dan dokumentasi. Di sepanjang kursus ini pelajar akan didedahkan kepada projek contoh, projek latihan dan rekabentuk dan kreativiti pelajar sendiri. Di antara tajuk-tajuk yang akan dibincangkan ialah rekabentuk berkomputer, ciri keselamatan, persesuaian elektromagnet dan teknologi pemasangan permukaan.

This course covers various activities of electronic designs which include design planning, drawing, experimenting, prototyping, testing, troubleshooting and final documentation. Along the course the students are exposed to sample project, exercise project and students' design and creativity. Topics also include CAD, safety, electromagnetic compatibility and surface mounting technology.

PHY4303 Pengantaramukaan Komputer dan Kawalan/ *Computer Interfacing and Control* 4(3+1)

Prasyarat : PHY3301 dan PHY3302

Kursus ini merangkumi pelbagai aspek pembinaan sistem pengantaramukaan yaitu dari sensor, kad perolehan data, perkakasan komputer pribadi dan perisian komputer dan hingga kepada penggunaannya. Perolehan data termasuklah teknik penukaran analog-berdigit, analisis data berdigit dan produk komputer di pasaran. Kursus ini juga meliputi cara kerja dalam komputer peribadi IBM dan setara dan tinjauan serta penggunaan perkakasan dan perisian terkini. Pelajar juga akan didedahkan dengan pembinaan perkakasan dan perisian sendiri. Pelbagai contoh penggunaan perantaraan komputer dalam makmal dan industri seperti pengukuran dan kawalan suhu, pembilang dan perakam masa, dan kawalan motor akan dibincangkan.

This course covers various aspects of setting up interfacing system, from sensor, data acquisition cards, PC hardware, to software. The data acquisition includes analog-digital conversion techniques, digital data analysis techniques and commercial PC products. The course also covers the inner workings of IBM PC and compatibles and a survey of current hardware and software. The student will be exposed how to build custom hardware and write their own software. Various examples of the application of computer interfacing in laboratory and industries will be discussed. These include temperature measurement and control, counter and timer, motor control etc.

PHY4304 Sistem Mikropengawal dan Rekabentuk/ *Microcontroller System and Design* 4(3+1)

Prasyarat : PHY3303

Kursus ini merangkumi prinsip teori dan gunaan sistem mikropengawal. Topik seperti senibina mikropengawal, perkakasan, bus dan sistem ingatan, antarmuka I/O, sistem masa dan kawalan masa sebenar dan sistem reka bentuk berasaskan mikropengawal dibincangkan. Kursus ini juga meliputi rangka kerja dan asas praktikal yang diperlukan untuk memupuk kemahiran kreativiti dan kerja berpasukan dan berkomunikasi hasil projek yang diperolehi menerusi lisan dan penulisan menerusi kerja makmal dan mini projek.

This course covers the theoretical and applied principles of a microcontroller system. Topics on microcontroller architecture, hardware, bus and memory system, I/O interface, timer system and real time control and designing microcontroller-based system will be discussed. Students are required to design creatively, work cooperatively with group of people, and communicate the results of the project both verbally and in written form through laboratory and mini project.





PHY4305 Instrumentasi Lanjutan/ *Advanced Instrumentation* 3(3+0)

Prasyarat : PHY3305

Kursus ini dimulakan dengan fizik asas yang berkaitan dengan pembinaan instrumentasi moden serta pelbagai aspek rekabentuk eksperimen, pengendalian maklumat dan penganalisaan data. Bahagian utama kursus ini adalah berkaitan dengan peralatan yang berasaskan sinaran elektromagnet tuju, arah tuju, pembelauan sinar-X dan pengimejan. Nama-nama bagi peralatan khas yang berkaitan dengan teknik ujian tanpa musnah, analisis terma, analisis permukaan, teknik magnet, teknik optik dan elektrik juga akan dibincangkan.

This course starts with fundamental physics that underlies many modern instrumentation and also several aspects of experimental design, information handling and data analysis. The main part of the course is concerned with the instrument whose techniques are based upon incident electromagnetic radiation, incident particles, X-ray diffraction and imaging. Topics on special instrument related to non-destructive techniques, thermal analysis, surface analysis, magnetic techniques, optical techniques and electrical techniques will be discussed.

PHY4401 Keelektromagnetan Gunaan/ *Applied Electromagnetism* 3(3+0)

Prasyarat : PHY3401

Kursus ini dimulai dengan mengulangkaji aspek asas persamaan Maxwell dan perambatan gelombang elektromagnet. Kemudian ianya diikuti dengan pembicaraan mengenai talian penghantaran, pemandu gelombang, prinsip elektromagnet dalam fotonik dan antenna. Setiap subjek yang diajar akan ditunjukkan penggunaannya dalam teknologi terkini.

This course covers Maxwell equations and propagation of plane waves. Transmission lines, wave guide, electromagnetic principles of photonic and antenna are also discussed. All discussions are followed with the examples from current technology applications.

PHY4402 Optik Moden/ *Modern Optics* 3(3+0)

Prasyarat : PHY3101 dan PHY3102

Kursus ini merangkumi fenomena optik yang berkaitan gelombang Elektromagnet (EM) seperti interferens, belauan, pengutuban dan punca cahaya koheren dan tak koheren. Laser, holografi dan beberapa spektroskopi optik dibincangkan.

This course covers the phenomenon of optics in term of electromagnetic (EM) waves such as interference, diffractions, polarisations and coherent and non-coherent sources. Laser, holography and optics spectroscopy are discussed.

PHY4502 Fizik Sinaran dan Radiobiologi/ *Radiation Physics and Radiobiology* 3(3+0)

Prasyarat : PHY3105

Kursus ini merangkumi punca sinaran, sifat serta salingtindaknya dengan jirim. Peralatan pengesan sinaran, kesan selepas pendedahan kepada sinaran dan pengawasan sinaran dibincangkan. Cara dan kaedah perlindungan dan pengawasan pengionan sinaran ditekankan.

This course covers radiation sources, their properties and interaction with matter. Radiation detectors, after-effects of irradiations and radiation control are discussed. Methods of protection and monitoring of ionizing radiation are emphasised.

PHY4503 Kerelatifan Khas dan Teori Medan Klasik/ *Special Relativity & Classical Field Theory* 3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini memperkenalkan prinsip kerelatifan khas, struktur ruang-masa, tensor dan penggunaannya dalam membincangkan kinematik, dinamik, keelektromagnetan, dan medan-medan klasik lain.





This course introduces the special relativity principles, the structure of space-time, tensors and their applications in doing kinematics, dynamics, electromagnetism and other classical fields.

PHY4504 Fizik Nuklear/ Nuclear Physics

3(3+0)

Prasyarat : PHY3105

Kursus ini merangkumi struktur asas nukleus dan ketidakstabilan nukleus dengan memberi penekanan kepada proses-proses reputan alfa, beta, gama dan pembelahan oleh neutron. Tindakbalas neutron dengan jirim, teori tindakbalas nukleus, prinsip peralatan dan pembinaan nuklear dan teknik eksperimen nuklear yang lain akan diberi. Pelbagai penggunaan nuklear melibatkan teknik pembelauan neutron, teknik penyinaran tanpa musnah, teknik penyurihan dan sebagainya akan dibincangkan. Prinsip fizik keunsuran yang melibatkan saling tindakan elektromagnet, saling tindakan lemah dan saling tindakan kuat diterangkan.

This course covers the basic nuclear structure and nuclear instability with emphasis on alpha, beta, gamma decay processes and nuclear fission. Interactions of neutrons with matter, nuclear reaction theory, the principle of nuclear instruments and installations and other nuclear experimental techniques will be given. Various nuclear applications involving neutron diffraction technique, non-destructive radiation technique, tracer technique etc will be discussed. The principle of particle physics involving electromagnetic interaction, weak interaction and strong interaction are explained.

PHY4601 Fizik Matematik/ Mathematical Physics

3(3+0)

Prasyarat : PHY3103 dan PHY3104

Kursus ini merupakan penyediaan pelajar kepada teknik-teknik asas penyelesaian matematik yang merangkumi topik-topik ruang vector yang termasuk aljabar dan kalkulus vector, matriks, siri Fourier dan jelmaan kamiran, penyelesaian persamaan pembezaan termasuk penyelesaian siri, fungsi-fungsi khas, analisis kompleks, persamaan pembezaan separa.

This course prepares the students to acquire basic mathematical techniques which include topics like vector spaces and vector algebra, matrices, Fourier series and integral transforms, solutions of differential equations including series solution, special functions, complex analysis, partial differential equations.

PHY4602 Fizik Pengkomputeran/ Computational Physics

4 (3+1)

Prasyarat : MTH3100

Kursus ini merangkumi pengenalan kepada komputer dan mengulangkaji asas kaedah berangka yang mudah seperti kamiran berangka, pembezaan berangka, operasi matriks dan penyelesaian masalah pembezaan. Penggunaan teknik di atas kepada fizik klasik, kuantum dan fizik statistik serta penganalisan data eksperimen akan dibincangkan. Bahan kuliah dan amali adalah saling berkaitan.

This course begins with an introduction to computer and a review of simple numerical methods such as numerical integration, numerical differentiation, matrix operation and the solution of differential equation. The application of such techniques to classical, quantum and statistical physics as well as analysis of experimental data is then emphasised. The lecture material and laboratory work are closely linked.

PHY4603 Mekanik Kuantum Lanjutan/ Advanced Quantum Mechanics

3(3+0)

Prasyarat : PHY3601

Kursus merangkumi tentang aspek lanjutan mekanik kuantum. Penekanan diberi terhadap penggunaan kaedah mekanik kuantum kepada aspek-aspek lebih realistik dan terperinci, seperti gabungan momentum sudut, teori serakan tiga dimensi dan kaedah hampiran untuk sistem keupayaan lebih rumit. Pengenalan kepada mekanik kuantum kerelatifan dibincangkan.





This course covers the advanced aspects of quantum mechanics. The focus is on the use of quantum mechanical methods to more realistic and detailed aspects like addition of angular momenta, scattering theory in three dimensions and approximation methods for systems with more involved potentials. Introduction to relativistic quantum mechanics are discussed.

PHY4901 Latihan Industri/ *Industrial Internship* 4(0+4)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini meliputi latihan industri selama 8 minggu di agensi kerajaan atau beberapa syarikat atau kilang industri yang terpilih. Latihan dikendalikan bersama oleh penyelarasan dan seorang penyelia atau pengurus dari agensi atau syarikat atau kilang tersebut.

This course covers an industrial training for a period of 8 weeks at various selected government agencies, companies or factories. The training is organized jointly by the coordinator and supervisor or the manager from the related agencies, company or factory.

PHY4902 Kursus Khas/ *Special Topics* 3(3+0)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini merangkumi tajuk tertentu/pilihan dalam bidang fizik pada peringkat tinggi. Kursus ini dirancang untuk memberikan kefahaman yang mendalam mengenai kajian khusus dan perkembangan terbaru dalam bidang fizik. Pemilihan topik pada masa tertentu akan ditentukan oleh Jabatan.

This course encompasses selected topics at advanced level in physics. An indepth understanding of specialised fields in physics and/or recent advances in physics is discussed. The choice of topics is determined by the Department.

PHY4995 Amali Lanjutan/ *Advanced Practicals* 3(0+3)

Prasyarat : Pelajar Tahun Akhir dan Dengan kebenaran Jabatan/ With permission of department

Kursus amali fizik ini direkabentuk untuk memberi pelajar peluang untuk memperolehi kemahiran yang perlu dan teknik untuk mengendalikan radas dengan cekap. Tujuan utama amali ini ialah untuk memberikan asas dalam sains eksperimen lanjutan yang akan membolehkan pelajar untuk mengendalikan penyelidikan secara sendiri. Pelajar juga akan diminta untuk membentangkan satu seminar mengenai topik yang ditentukan.

This course is designed to give the student opportunities to acquire the necessary skills and techniques to be able to handle advance laboratory equipment with high degree of competency. The primary goal of the laboratory is to provide a foundation in advance experimental science so that the students will ultimately able to carry out independent research. Students will also be asked to present a seminar of a given topic.

PHY4999 Projek Ilmiah Tahun Akhir/ *Final Year Academic Project* 6(0+6)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini merangkumi sorotan bahan rujukan, penggunaan teknik penyelidikan yang sesuai, pengumpulan dan analisis data, penafsiran keputusan, perbincangan dan kesimpulan kajian saintifik dalam projek penyelidikan atau projek multimedia.

This course covers literature review, use of appropriate research techniques, data collection and analyses, interpretation of results, discussion and conclusion of scientific studies in research or multimedia project.





Jabatan Kimia/ Department of Chemistry

CHM2000 Kimia Am/ *General Chemistry* 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi tajuk umum dalam bidang kimia fizik, tak organik dan organik. Struktur atom dan jadual berkala, ikatan kimia dan struktur, stoikiometri, keadaan jirim, keseimbangan kimia, kinetik kimia, elektrokimia, kimia bukan logam dan logam dibincangkan. Penamaan, sifat dan tindak balas beberapa kumpulan berfungsi sebatian organik juga dibincangkan.

This course covers general topics in physical, inorganic and organic chemistry. Atomic structure and periodic table, stoichiometry, state of matter, chemical equilibrium, chemical kinetics, electrochemistry, chemistry of nonmetals and metals are discussed. Nomenclature, properties, and reactions of various functional groups of organic compounds are also discussed.

CHM3010 Kimia Fizik dan Tak Organik/ *Physical and Inorganic Chemistry* 4(3+1)

Prasyarat : Tiada

Kursus ini merangkumi beberapa aspek asas dalam kimia fizik dan tak organik termasuk teori atom moden, jadual berkala dan sifat berkala, kimia kumpulan utama, teori pengikatan, sifat gas, cecair dan pepejal, keseimbangan kimia, elektrokimia, termodinamik, kinetik dan kimia nukleus.

This course covers basic aspects of physical and inorganic chemistry, including modern atomic theory, periodic table and periodic properties, main group element, theory of bonding, properties of gas, liquid and solid, chemical equilibrium, electrochemistry, thermodynamics, kinetics and nuclear chemistry.

CHM3101 Kimia Fizik/ *Physical Chemistry* 4(3+1)

Prasyarat : CHM3010

Kursus ini merangkumi aspek kimia fizik berkaitan dengan teori kinetik dan tindak balas kompleks. Hukum termodinamik, larutan, keseimbangan fasa, elektrolit dan elektrokimia, koloid dan kuantum mekanik turut dibincangkan.

This course covers aspects of physical chemistry related to kinetic theory, reaction mechanism and complex reactions. Thermodynamic laws, solutions, phase equilibrium, electrolytes, electrochemistry, colloids and quantum mechanics are also discussed.

CHM3102 Kimia Polimer/ *Polymer Chemistry* 3(2+1)

Prasyarat : CHM3010

Kursus ini merangkumi nama yang berkaitan dengan jenis polimer, mekanisme dan kinetik pempolimeran, pengkopolimeran, larutan polimer, penentuan berat molekul, keadaan berkaca, analisis terma polimer, kekenyalan getah dan kelikatkanyalan.

This course covers topics related to types of polymers, mechanism and kinetics of polymerisation, copolymerisation, polymer solution, determination of molecular weight, glassy state, thermal analysis of polymers, rubber elasticity and viscoelasticity.

CHM3103 Kinetik Kimia/ *Chemical Kinetics* 3(2+1)

Prasyarat : CHM3101

Kursus ini merangkumi tajuk berkaitan dengan kinetik kimia dalam fasa gas dan cecair, tindak balas bermangkin asid bes dan enzim, jerapan, tindak balas permukaan dan cepat.

This course covers topics related to chemical kinetics in the gases and liquid phases, acid base catalysis and enzymatic reactions, adsorption, surface and fast reactions.





CHM3104 Termodinamik Kimia/ *Chemical Thermodynamics* 3 (2+1)

Prasyarat : CHM3101

Kursus ini meliputi nama hukum termodinamik dan kegunaannya dalam bidang kimia termasuk perubahan fizikal bahan tulen, larutan, keseimbangan kimia dan keseimbangan fasa.

This course includes topics in laws of thermodynamic and their applications in chemistry including physical changes of pure compounds, solutions, chemical equilibrium and phase equilibrium.

CHM3201 Kimia Organik I/ *Organic Chemistry I* 4(3+1)

Prasyarat : Tiada

Kursus ini meliputi tajuk struktur, ikatan, tatanama, sifat, tindak balas, sintesis dan kepentingan berbagai kelas sebatian organik,serta pengisomeran optik.

This course covers topics related to structure, bonding, nomenclature, properties, reactions, synthesis and the importance of the various classes of organic compounds, as well as optical isomerism.

CHM 3202 Kimia Organik II/ *Organic Chemistry II* 4(3+1)

Prasyarat : CHM3201

Kursus ini meliputi nama stereokimia dan analisis konformasi, tindak balas penukargantian aromatik, kimia aromatik lanjutan, pengenalan kepada sebatian heterosiklik dan semulajadi serta sintesis organik.

This course covers topics in stereochemistry and conformational analysis, aromatic substitution reaction, advanced aromatic chemistry, introduction to heterocyclic and natural products compounds, and organic synthesis.

CHM3203 Kimia Organik III/ *Organic Chemistry III* 3(2+1)

Prasyarat : CHM3201

Kursus ini merangkumi nama berkaitan dengan sintesis organik, penggunaan sebatian organologam, pengoksidaan dan penurunan, tindak balas bersekali dan elektrosiklik, serta strategi sintesis dalam kimia organik.

This course covers topics related to organic synthesis, the use of organometallic compounds, oxidation and reduction, concerted and electrocyclic reactions and synthetic strategies in organic chemistry.

CHM3204 Kimia Organik IV/ *Organic Chemistry IV* 4(3+1)

Prasyarat : CHM3203 dan CHM3402

Kursus ini merangkumi nama biosintesis metabolit sekunder, termasuk terbitan asid syikimik, sebatian C_6 - C_{10} sebatian sterpenoid dan steroid, biosintesis alkaloid berdasarkan asid amino alifatik, asid amino aromatik dan triptofan, biosintesis alkaloid morfina, feromon dan kairomon, dan saling tindak tumbuhan-tumbuhan dan tumbuhan-serangga dengan lebih mendalam. Selain daripada itu, penggunaan lanjut kaedah spektroskopi dalam penentuan struktur organik, konsep fotokimia serta nama-nama penting dalam kimia organik fizik akan dibincangkan.

This course covers topics related to biosynthesis of secondary metabolites, including shikimic acid derivatives, C_6 - C_{10} compounds, terpenoids and steroids, biosynthesis of alkaloids based on aliphatic amino acid, aromatic amino acids and tryptophan, morphine alkaloid biosynthesis, pheromones and chryomones, plant-plant and plant-insect interactions. Besides that, further applications of spectroscopic methods in structural elucidation, concepts on photochemistry and few main topics in physical organic chemistry will also be discussed.





- CHM3301 Kimia Tak Organik I/ *Inorganic Chemistry I* 3(2+1)
Prasyarat : Tiada
Kursus ini merangkumi konsep asas dalam kimia tak organik, simetri, kumpulan titik, kimia hablur, kecacatan hablur, larutan pepejal, oksida, silikat dan hidrida.
This course covers basic concepts in inorganic chemistry, symmetry, point group, crystal chemistry, crystal defects, solid solutions, oxides, silicates and hydrides.
- CHM3302 Kimia Tak Organik II/ *Inorganic Chemistry II* 3(2+1)
Prasyarat : CHM3301
Kursus ini merangkumi beberapa sifat umum unsur dan kompleks logam peralihan, penggunaan teori kumpulan dalam menentukan simetri kompleks orbital atom dan molekul, teori ikatan logam-ligan dan pendekatan teori berkenaan dalam menerangkan spektrum elektronik, sifat kemagnetan kompleks logam peralihan, kereaktifan dan mekanisma, kaedah sintesis semasa penyediaan sebatian tak organik dan organologam, dan pengenalan kepada kimia bioinorganik asas.
This course covers several general properties of elements and complexes of transition metals, the application of group theory in assigning the symmetry of metal complexes, atomic and molecular orbitals, metal-ligand bonding theories and their approaches toward explaining the electronic spectra, magnetic properties of transition metal complexes, reactivity and mechanisms, current synthetic methods of inorganic and organometallic compounds, and an introduction to basic bioinorganic chemistry.
- CHM3303 Kimia Tak Organik III/ *Inorganic Chemistry III* 3(2+1)
Prasyarat : CHM3301
Kursus ini meliputi nama logam peralihan, logam nadir bumi dan sebatian organologam serta kegunaannya dalam industri khususnya di dalam pemangkinan homogen dan heterogen.
This course covers transition metals, rare earth metals and organometallic compounds as well as their uses in industry, especially in homogeneous and heterogeneous catalysis.
- CHM3304 Kimia Tak Organik IV/ *Inorganic Chemistry IV* 3 (2+1)
Prasyarat : CHM3302
Kursus ini merangkumi konsep penting dalam kimia tak organik termasuk kecacatan kimia, larutan pepejal, organologam dan mekanisma tindak balas. Perbincangan mengenai nama pilihan bagi tujuan pendedahan kepada bahan dan perkembangan baru dalam kimia takorganik diberikan.
This course covers important concepts in inorganic chemistry including crystal defects, solid solutions, organometallic compounds and reaction mechanisms. Discussion on selected topics designed to expose students to new materials and developments in inorganic chemistry is given.
- CHM3401 Kimia Analisis/ *Analytical Chemistry* 3(2+1)
Prasyarat : CHM3010
Kursus ini membincangkan kaedah asas dalam kimia analisis seperti titrimetri, gravimetri, kromatografi, elektrokimia, analisis terma, pemisahan pelarut, kaedah radiokimia dan analisis suntikan aliran.
This course covers the basic methods in analytical chemistry such as titrimetry, gravimetry, chromatography, electrochemistry, thermal analysis, solvent extraction, radiochemical methods and flow injection analysis.





CHM3402 Spektroskopi Kimia/ *Chemical Spectroscopy* 4(3+1)

Prasyarat : CHM3010 dan CHM3201

Kursus ini merangkumi pengenalan kepada kaedah spektroskopi yang biasa digunakan dalam bidang analisis, seperti IR, UV, NMR, MS, AA, belauan sinar x, dan pendarfluor serta pentafsiran data spektroskopi ditekankan.

This course covers the introduction to spectroscopic methods commonly used in chemical analysis, such as IR, UV, NMR, MS, AA, X ray diffraction, and fluorescence, as well as interpretation of spectroscopic data is emphasised.

CHM3500 Prinsip Teknologi Kimia/ *Chemical Technology Principles* 4(4+0)

Prasyarat : CHM3101

Kursus ini merangkumi imbangan bahan, imbangan tenaga, pemindahan jisim, pemindahan haba, teknologi zarah, mekanik bendalir, penyulingan, penyerapan dan penyarian, penyejatan dan pengeringan, proses pemisahan, dan reaktor unggul.

This course covers materials balances, energy balances, mass transfer, heat transfer, particle technology, fluid mechanics, distillation, absorption and extraction, evaporation and drying, separation processes, and ideal reactors.

CHM3501 Kimia Perindustrian I/ *Industrial Chemistry I* 3(3+0)

Prasyarat : CHM3301

Kursus ini memperkenalkan beberapa aspek penting kimia perindustrian. Ini termasuk bekalan air industri, penghasilan dan kegunaan gas industri, ciri dan kegunaan bahan peletup dan propelan, punca dan penghasilan industri logam, fosforus dan sulfur, penghasilan cat, varnis dan dakwat, ciri-ciri dan pembuatan simen, konkrit dan seramik.

In this course, several important aspects of industrial chemistry are presented. These include industrial water supply, production and use of industrial gases, characteristics and use of explosives and propellants, supply and production in the metals, phosphorus and sulphur industries, manufacture of paint, varnish and ink, characteristics and production of cement, concrete and ceramics.

CHM3502 Kimia Perindustrian II/ *Industrial Chemistry II* 3(3+0)

Prasyarat : CHM3202

Kursus ini merupakan lanjutan kajian Kimia Perindustrian I. Tajuk yang dibincangkan termasuk teknologi arang batu, proses penapaian dalam perindustrian, industri gula dan kanji, petroleum dan bahan petrokimia, ciri dan pembuatan sabun dan detergen, penghasilan dan kegunaan bahan farmasi dan kosmetik, industri pewarna dan pigmen, sintesis dan formulasi racun rumpai, racun kulat dan racun serangga.

This course is an extension of Industrial Chemistry I. The topics discussed include charcoal technology, industrial fermentation processes, sugar and starch industries, petroleum and petrochemicals, characteristics and manufacture of soaps and detergents, production and use of pharmaceuticals and cosmetics, the dyes and pigments industry, the synthesis and formulation of herbicides, fungicides and insecticides.

CHM3503 Kimia Polimer Perindustrian/ *Industrial Polymer Chemistry* 3(3+0)

Prasyarat : CHM3102

Kursus ini merangkumi kimia polimer gunaan. Tajuk perbincangan termasuk sifat, penyediaan, penggunaan, teknologi pengeluaran dan pemrosesan, pengubahsuai kimia dan kawalan mutu dan kos plastik, getah dan getah tiruan, pengeluaran dan penggunaan gentian buatan, gentian kaca dan karbon, pengeluaran dan penggunaan perekat, dan teknologi kayu dan kertas.





This course covers applied polymer chemistry. Topics of discussion include the characteristics, preparation, uses, production and processing technology, chemical modification and quality and cost control of plastics, rubber and synthetic rubber; the production and use of synthetic fibres, carbon fibres and fiberglass; the manufacture and use of adhesives; and wood and paper technology.

CHM3504 Oleokimia/ Oleochemistry 3(2+1)

Prasyarat : CHM3202

Kursus ini merangkumi berbagai aspek minyak dan lemak termasuk terbitan oleokimia. Ia menekankan penggunaan teknologi terkini termasuk mikroemulsi dan bioteknologi. Lawatan ke kilang pengeluaran minyak dan lemak diatur.

This course covers various aspects of oils and fats, including oleochemical derivatives. The use of latest technology including microemulsion and biotechnology are also discussed. Visits to factories producing oils and fats are arranged.

CHM3601 Kimia Petroleum/ Petroleum Chemistry 3(3+0)

Prasyarat : CHM3202

Kursus ini merangkumi berbagai aspek dan elemen dalam industri petroleum. Ia melibatkan nama asal-usul minyak dan gas, geosains, pengembangan dan struktur industri petroleum, eksplorasi dan kaedah pengeluaran.

This course covers various aspect and elements of petroleum industry. It involves lectures on origin of oil and gas, geoscience, development and structure of petroleum industry, exploration and method of production.

CHM3602 Proses Penapisan Petroleum/ Petroleum Refining Processes 3(3+0)

Prasyarat : CHM3601

Kursus ini merangkumi pengenalan, hasil penapisan, bahan suapan penapisan, penyulingan minyak mentah, proses pengkokan tertunda, pembentukan semula bermangkin dan pengisomeran, peretakan bermangkin penghidrorawatan, penghidroretakan bermangkin, pengalkilan, pengadunan bahan hasil dan proses sokongan.

This course covers introduction, refinery products, refinery, feedstocks, crude distillation, delayed coking, catalytic reforming and isomerisation, catalytic cracking, hydrotreating, catalytic hydrocracking, alkylation, product blending and supporting processes.

CHM3603 Petrokimia/ Petrochemicals 3(3+0)

Prasyarat : CHM3602

Kursus ini melibatkan perbincangan proses menyediakan bahan perantaraan kimia termasuk keadaan dan carta-alir bagi menghasilkan bahan kimia atau bahan akhir dari bahan-bahan petroleum untuk kegunaan bukan bahan api. Antara topik yang dibincangkan ialah bahan-bahan petrokimia dari metana, etana-etilena, propana-propilena, butana-butilena dan hidrokarbon aromatik. Pembuatan plastik, elastomer, detergen dan bahan hasil khusus.

This course deals with processes for production, of chemicals intermediate including conditions and flow-chart to produce either chemicals of finish products from petroleum. Topics in this course include petrochemicals from methane, ethane-ethylene, propane-propylene, butane-butylene and aromatic hydrocarbons. Productions of plastics, elastomers, detergents and other special products.





CHM3604 Kawalan Tumpahan Minyak/ *Oil Spill Control* 3 (3+0)

Prasyarat : CHM3601

Kursus ini merangkumi aspek tumpahan minyak dan kawalannya dalam industri petroleum. Ia termasuk perbincangan ciri tumpahan minyak, perawatan kimia-fizikal dan biologi, ekonomi dan peraturan antarabangsa mengenai tumpahan minyak. Lawatan ke agensi dan industri yang terlibat dalam kawalan tumpahan minyak.

This course covers aspects in controlling oil spill in the petroleum industry. It includes discussion on the spill characteristics, chemical-physical and biological treatments, economics, and international regulation on oil spill. A field trip to agencies and industries involved in oil spill control.

CHM3701 Kimia Pengkomputeran/ *Computational Chemistry* 4(3+1)

Prasyarat : CHM3101

Kursus ini merangkumi aspek kimia pengkomputeran termasuk pengenalan kepada kimia pengkomputeran dan pemodelan molekul, mekanik kuantum, mekanik molekul dan dinamik molekul, mekanik statistik, hubungan struktur-sifat, pengiraan simbolik, kepintaran buatan dan penvisualan.

This course covers aspects of computational chemistry including introduction to computational chemistry and molecular modeling, quantum mechanics, molecular mechanics and molecular dynamics, statistical mechanics, structure-property relationship, symbolic calculations, artificial intelligent and visualization.

CHM4001 Kimia Perindustrian/ *Industrial Chemistry* 3(3+0)

Prasyarat : CHM3010 dan CHM3201

Kursus ini merangkumi pemprosesan bahan sumber asli seperti petroleum, getah asli, minyak sayur, lemak haiwan, sulfur, nitrogen, timah, besi, aluminium dan industri berasaskan bahan kimia, polimer sintetik, sabun, detergen, cat, pigmen dan simen turut dibincangkan.

This course covers the processing of natural resources such as petroleum, natural rubber, vegetable oils, animal fats, sulfur, nitrogen, tin, iron, aluminium. Industries based on chemicals, synthetic polymer, soap, detergents, paints, pigments and cement are also discussed.

CHM4101 Kimia Keadaan Pepejal/ *Solid State Chemistry* 3 (3+0)

Prasyarat : CHM3101 dan CHM3301

Kursus ini merangkumi struktur, taburan elektron dan kecacatan dalam hablur serta kesan mereka ke atas kekonduksian, tindak balas pepejal dan pemangkinan.

This course covers structure, electronic distribution and defects in crystals and their effects on conductivity, solid state reactions and catalysis.

CHM4102 Elektrokimia/ *Electrochemistry* 3(3+0)

Prasyarat : CHM3101, CHM3401

Kursus ini meneliti dengan mendalam perkara-perkara yang berkaitan dengan elektrokimia seperti aktiviti ion, nombor angkutan, kekonduksian, persamaan Debye-Huckel dan Onsager, keupayaan elektrod berbalik, lapisan berganda elektrik, proses elektrod, voltametri, potensiometri (elektrod pemilih ion), dan pengelektroenanapan.

This course studies indepth various topics in electochemistry such as ion activity, transport number, ionic mobility, conductance, Debye-Huckel and Onsager equations, reversibility of electrode potential, electrical double layer, electrode processes, voltammetry, potentiometry (ion selective electrode) and electrodeposition.





CHM4201 Tajuk Khas Kimia Organik/ *Special Topics in Organic Chemistry* 3(3+0)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini merangkumi perbincangan mendalam tentang topik-topik terpilih dalam kimia organik lanjutan yang akan ditentukan oleh Jabatan.

Selected topics in advanced organic chemistry which will be determined by the Department discussed in depth in the lecture.

CHM4701 Pemangkinan/ *Catalysis* 3(3+0)

Prasyarat : CHM3101

Kursus ini merangkumi pengenalan kepada mangkin, pengkelasan mangkin heterogen, teknik-teknik penyediaan, proses penyerapan, tindak balas permukaan, mekanisme tindak balas dan penciannya. Aplikasi mangkin di dalam industri petroleum, industri kimia halus, sintesis sebatian organik dan pengawalan pencemaran alam sekitar turut dibincangkan.

This course covers introduction of catalyst, the classification of heterogeneous catalyst, preparation techniques, adsorption process, surface reaction, reaction mechanism and its characterisation. The application of catalysts in petroleum and fine chemical industries, synthesis of organic compounds and controlling environmental pollution will be discussed.

CHM4901 Latihan Industri/ *Industrial Training* 4(0+4)

Prasyarat : Dengan kebenaran Jabatan/ With permission of department

Kursus ini meliputi latihan industri selama 8 minggu di agensi kerajaan atau beberapa syarikat atau kilang industri yang terpilih. Latihan dikendalikan bersama oleh penyelarasan dan seorang penyelia atau pengurus dari agensi atau syarikat atau kilang tersebut.

This course covers an industrial training for a period of 8 weeks at various selected government agencies, companies or factories. The training is organized jointly by the coordinator and supervisor or the manager from the related agencies, company or factory.

CHM4999 Projek Ilmiah Tahun Akhir/ *Final Year Academic Project* 6(0+6)

Prasyarat : Pelajar Sulung Kimia/Kimia Perindustrian/Kimia Petroleum

Kursus ini merangkumi sorotan bahan rujukan, penggunaan teknik penyelidikan yang sesuai, pengumpulan dan analisis data, penafsiran keputusan, perbincangan dan kesimpulan kajian saintifik dalam projek penyelidikan atau projek multimedia.

This course covers literature review, use of appropriate research techniques, data collection and analyses, interpretation of results, discussion and conclusion of scientific studies in research and multimedia project.





Jabatan Matematik/ Department of Mathematics

MTH3100 Kalkulus/ *Calculus* 3(3+0)

Prasyarat : Tiada

Kursus ini merangkumi pembinaan konsep dalam kalkulus satu pembolehubah, konsep set dan fungsi untuk memahami idea mengenai had, keselanjaran dan terbitan. Pembezaan dan teorem yang berkaitan kamiran sebagai proses anti-terbitan serta teknik kamiran dibincangkan.

This course covers the building up of the concepts in calculus of one variable, the concept of sets and functions to understand the idea of limits, continuity and derivatives. Differentiations and theorems related to integration as a process of anti-derivatives together with the integration techniques are discussed.

MTH3101 Kalkulus Lanjutan/ *Advanced Calculus* 3(3+0)

Prasyarat : MTH3100

Kursus ini meliputi teorem asas kalkulus. Fungsi banyak pembolehubah yang melibatkan kalkulus pembezaan dan kamiran dibincangkan. Jujukan dan siri nombor nyata dan fungsi nyata turut dibincangkan.

This course covers theorems on elementary calculus, followed by functions of several variables, involving differential and integral calculus. Sequence and series of real numbers and functions are also discussed.

MTH3102 Persamaan Pembezaan/ *Differential Equations* 3(3+0)

Prasyarat : MTH3100 dan MTH3200

Kursus ini merangkumi pengelasan persamaan pembezaan dan kaedah penyelesaian persamaan pembezaan linear. Diikuti dengan kaedah membina penyelesaian am daripada beberapa penyelesaian khusus yang diperolehi, terutama dari satu set penyelesaian yang tidak bersandar linear. Kaedah pekali tak ditentukan dan ubahan parameter, jelmaan Laplace dan penggunaannya kepada masalah nilai awal dan nilai sempadan dibincangkan.

This course covers classification of differential equations and methods of solving linear differential equations. Followed by methods of constructing general solutions from several particular solutions obtained, especially from a set of linearly independent solutions. Methods of undetermined coefficients and variations of parameter, Laplace transform and it's applications to initial value and boundary value problems are discussed.

MTH3103 Analisis Vektor/ *Vector Analysis* 3(3+0)

Prasyarat : MTH3100

Kursus ini merangkumi aspek vektor dalam ruang berdimensi n , ($n > 2$), hasil darab titik dan hasil darab silang. Kaedah pembezaan vektor, kamiran vektor dan koordinat lengkung linear dibincangkan.

This course covers aspects of vectors in n -dimensional space, ($n > 2$), dot and cross products. Vector differentiation, vector integration and curvilinear coordinates are discussed.

MTH3104 Kaedah Matematik/ *Mathematical Methods* 3(3+0)

Prasyarat : MTH3102, MTH3201

Kursus ini merangkumi konsep operasi linear, pengoperasi linear, perwakilan matriksnya dan siri Fourier. Penyelesaian bersiri bagi persamaan pembezaan biasa dan fungsi khas yang terjana, persamaan pembezaan separa dan kaedah penyelesaian yang merangkumi pemisah pembolehubah dan kaedah jelmaan dibincangkan.





The course covers the concept of linear operation, linear operators, their matrix representations and Fourier series. Series solutions to ordinary differential equations and the special functions generated, partial differential equations and methods of solutions which cover separable variable and transformation method are discussed.

MTH3200 Aljabar/ Algebra 3(3+0)

Prasyarat : Tiada

Kursus ini merangkumi teori mantik dan set, sistem nombor nyata dan kompleks, jujukan dan siri mudah, polinomial dan teori persamaan. Geometri koordinat, aljabar vektor dan penyelesaian sistem persamaan linear, asas dan sistem koordinat dalam R^2 dan R^3 dibincangkan.

This course covers mantic and set theories, real and complex number systems, elementary sequence and series, polynomials and theory of equations. Coordinate geometry, vector algebra and solutions to system of linear, basis and coordinate systems in R^2 and R^3 are discussed.

MTH3201 Aljabar Linear/ Linear Algebra 3(3+0)

Prasyarat : MTH3100 dan MTH3200

Kursus ini merangkumi ruang vektor, transformasi linear, perwakilan matriks, keserupaan matriks, nilai eigen, vektor eigen dan ruang eigen.

This course covers vector space, linear transformation, matrix representation, similar matrices, eigen values, eigen vectors and eigen space.

MTH3202 Pengenalan Kepada Aljabar Moden/ Introduction to Modern Algebra 3(3+0)

Prasyarat : MTH3201

Kursus ini mencakupi konsep berkaitan set, fungsi dan set integer. Kekongruenan linear, hubungan kesetaraan, kumpulan, gelanggang, medan serta pemetaan. Idea asas mengenai hasil darab terus kumpulan, teori unggunan dan operasi asas melibatkan unggunan turut dibincangkan.

This course covers concepts related to sets, functions and the set of integers. Linear congruence, equivalence relations, group, rings, fields and mapping are discussed. Basic ideas on direct products of groups, theory of ideals and basic operation involving ideals are also discussed.

MTH3301 Analisis Nyata/ Real Analysis 3(3+0)

Prasyarat : MTH3101

Kursus ini merangkumi konsep ruang metrik, fungsi selanjur dan ide mengenai set terbuka dan tertutup dalam ruang tersebut. Ciri ruang metrik, jujukan nombor nyata dan jenisnya, teorem titik tetap dan teorem Heine-borel dan jenis ruang metrik dibincangkan.

This course covers the concept of metric space, continuous functions and ideas concerning open and closed sets in such space. Characteristics of metric space, sequence of real numbers and its types, fixed point theorem and Heine-Borel theorem and types of metric spaces are discussed.

MTH3302 Analisis Kompleks/ Complex Analysis 3(3+0)

Prasyarat : MTH3101

Kursus ini meliputi aljabar nombor kompleks, fungsi analisis, fungsi permulaan dan pemetaannya. Kamiran kompleks, teorem Cauchy, teorem Liouville, teorem modulus maksimum dikaji. Siri kuasa Taylor, pensifar dan kutub, teorem raja, penilaian kamiran kontur dan pemetaan mensebentuk dibincangkan.





The course covers algebra of complex numbers, analytic functions, elementary functions and mapping, complex integration, Cauchy's theorem and integration formula, Liouville's theorem, maximum modulus theorem, fundamental theorem of algebra, power series, Taylor's series, zeroes and poles, residues, the residue theorem, evaluation of contour integrals and conformal mapping.

MTH3401 Kebarangkalian dan Statistik I/ *Probability and Statistics I* 3(3+0)

Prasyarat : MTH3100

Kursus ini merangkumi konsep asas statistik termasuk pembolehubah rawak, kebarangkalian, taburan khas, jangkaan dan momen, penganggaran dan ujian hipotesis, regresi dan korelasi sehingga kepada dua pembolehubah merdeka.

This course covers fundamental concepts of statistics including random variables, probability, special distributions, expectations and moments, estimation and hypothesis testing, regression and correlation up to two independent variables.

MTH3402 Kebarangkalian Dan Statistik II/ *Probability And Statistics II* 3(3+0)

Prasyarat : MTH3401

Kursus ini merangkumi konsep kebarangkalian, pembolehubah rawak, fungsi ketumpatan kebarangkalian, taburan kebarangkalian, jangkaan matematik dan fungsi penjana momen. Jenis taburan, fungsi pembolehubah rawak, penjelmaan pembolehubah, pensampelan dan ujian hipotesis dibincangkan.

This course covers probability concept, random variables, probability density functions, probability distributions, mathematical expectations and moment generating functions. Types of distributions, function of random variable, variable transformation, sampling and testing of hypothesis are discussed.

MTH3403 Rekabentuk Ujikaji/ *Experimental Design* 3(3+0)

Prasyarat : MTH3401

Kursus ini merangkumi konsep asas statistik, prinsip asas rekabentuk ujikaji, matlamat serta penerapannya. beberapa rekabentuk penting dengan analisis yang bersesuaian dikaji. Rekabentuk yang dipertimbangkan ialah rawak lengkap, blok rawak lengkap, blok rawak tak lengkap seimbang, segiempat sama Latin, segi empat sama Youden dan faktor 2^k dan 3^k dikaji.

This course covers basic concepts in statistic basic principles in design of experiments, their aims and implementations. Several important designs and their appropriate analyses are studied. The designs considered are complete randomised, complete randomised block, Latin square, balanced incomplete randomised block, Youden square, two factors and three factors factorials, 2k and 3k factorials.

MTH3404 Model Linear/ *Linear Model* 3(3+0)

Prasyarat : MTH3402

Kursus ini merangkumi jenis dan aljabar matriks, nilai dan vektor eigen, taburan normal multivariat, min dan varians serta taburan bentuk kuadratik. Langkah penganggaran dan pengujian hipotesis ke atas parameter model regresi linear pangkat penuh dan pangkat tak penuh dan pengiraan pekali korelasi sampel menggunakan pendekatan matriks juga dicerakinkan.





This course covers types and algebra of matrices, eigen values and vectors, and the multivariate normal distribution, the mean, variance and distribution of quadratic forms. Estimation steps and hypothesis testing on parameters of full rank and non full rank linear regression models and calculation of the sample correlation coefficient using matrix approach is analysed.

MTH3405 Tajuk-Tajuk Khas Dalam Penggunaan Pakej Statistik/ 3(2+1)
Special Topics In Application Of Statistical Package

Prasyarat : MTH3401, MTH3403 dan MTH3404

Kursus ini merangkumi pakej statistik yang terpilih termasuk penggunaannya secara praktikal bagi menyelesaikan masalah statistik.

This course covers selected statistical packages including the practical usage in solving statistical problems.

MTH3406 Kawalan Kualiti Berstatistik/*Statistical Quality Control* 3(3+0)

Prasyarat : MTH3402

Kursus ini merangkumi teknik peningkatan kualiti dengan menggunakan statistik kawalan proses. Punca variasi, carta kawalan piawai Schewart, prosedur Cusum dan carta EWMA, analisis kebolehpayaan proses dan system pengukuran, ujikaji faktor, faktor separa bagi rekabentuk proses dan peningkatannya serta pensampelan penerimaan dibincangkan.

The course covers techniques for quality improvement through the use of statistical process control. Sources of variations, the standart Schewarts control chart, Cusum procedures and EWMA charts, process and measurement system capability analysis, factorial and fractional factorial experiments for process design and improvement together with the acceptance sampling are discussed.

MTH3407 Kebarangkalian Pertengahan/*Intermediate Probability* 3(3+0)

Prasyarat : MTH3402

Kursus ini merangkumi kebarangkalian pada peringkat pertengahan. Sorotan kebarangkalian asas, persyaran, ketaksamaan, fungsi cirian dan statistik tertib, penumpuan dan teorem berkaitan dibincangkan.

This course covers probability at the intermediate level. Topics discussed include a review of basic probability, conditioning, inequalities, characteristic function and order statistics. Convergence and the related theorems are discussed.

MTH3408 Pengenalan Kepada Kaedah Bayes/*Introduction To Bayesian Method* 3(3+0)

Prasyarat : MTH3402

Kursus ini merangkumi konsep dan teori Bayes, taburan prior dan posterior, keluarga konjugat dan prior tak wajar, pentakbiran Bayes, peramalan, penganggaran titik dan selang berkredibiliti.

This course covers concepts and Bayesian theories, prior and posterior distribution, conjugate family and improper prior, Bayesian inference, predictions, point estimation and credibility interval.

MTH3409 Statistik Berkomputasi/*Computational Statistics* 3(2+1)

Prasyarat : MTH3402 dan MTH3405

Kursus ini merangkumi teori dan aplikasi teknik pengkomputeran dalam menyelesaikan masalah berstatistik dan melaksanakan simulasi berstatistik menggunakan bahasa pengaturcaraan terpilih.

This course covers the theory and application of computing techniques in solving statistical problems and performing statistical simulations using selected programming language.





MTH3500 Pengaturcaraan Komputer dalam Matematik/ *Computer Programming in Mathematics* 4(3+1)

Prasyarat : Tiada

Kursus ini merangkumi pengaturcaraan komputer bagi menyelesaikan masalah matematik. Kemahiran membentuk algoritma, merekabentuk, mengkod, mengawalsilap dan mendokumen aturcara dengan menggunakan teknik dan gaya pengaturcaraan yang betul dan berkesan ditekankan. Kaedah membina algoritma dan merekabentuk aturcara dengan cartalir atau pseudo-kod dan konsep pengaturcaraan berstruktur dibincangkan.

This course covers computer programming for solving mathematical problems. Algorithm building skills, designing, coding, debugging and documenting using good and efficient programming techniques and styles are emphasis. Programme designing using flowcharts or pseudo-code and structured programming concept are discussed.

MTH3501 Analisis Berangka/*Numerical Analysis* 3(3+0)

Prasyarat : MTH3500, MTH3102, MTH3201

Kursus ini merangkumi kaedah penentu dalam, penyelesaian berangka persamaan linear dan tak linear, penyelesaian berangka persamaan pembezaan biasa, pembezaan dan kamiran berangka dan analisis ralat.

This course covers method of interpolation, numerical solution of linear and non-linear equations, numerical solution of ordinary differential equations, numerical differentiation and integration and error analysis.

MTH3602 Pengaturcaraan Bermatematik/ *Mathematical Programming* 3(3+0)

Prasyarat : MTH3102 dan MTH3201

Kursus ini menyediakan teknik bermatematik yang digunakan sebagai alat untuk menyelesaikan masalah pemaksimuman atau meminimuman.

This course provides some mathematical techniques which are used as the tools for solving maximization or minimization problems.

MTH3701 Matematik Kewangan/ *Financial Mathematics* 3(3+0)

Prasyarat : MTH3100

Kursus ini mencakupi teori dan kuasa faedah, berbagai jenis anuiti, bon-bon, pembelanjawan dan susutan modal. Kaedah perhitungan premium bagi insurans nyawa turut dibincangkan.

This course covers the theory and force of interest, various types of annuities, bonds, capital budgeting and depreciation. Methods of life insurance premium calculations are also discussed.

MTH3901 Proses Penyelidikan Dalam Matematik Dan Statistik/ *Research Processes In Mathematics And Statistics* 3(1+2)

Prasyarat : MTH3500

Kursus ini merangkumi proses dan kaedah penyelidikan mengguna perpustakaan dan mencari maklumat. Teknik kreatif penyelesaian masalah dan pengenalan kepada kaedah matematik dan statistik dibincang. Kaedah penulisan saintifik, pembentangan dan penerbitan diterangkan.

This course covers research process and methods, library usage and information retrieval. The techniques of creative problem solving and introduction to mathematical and statistical methods are discussed. The methods of scientific writing, presentations and publications are described.





MTH4102 Teori Persamaan Pembezaan/ *Theory Of Ordinary Differential Equations* 3(3+0)

Prasyarat : MTH3102, MTH3301

Kursus ini merangkumi teori kuantitatif tulen, teori kuantitatif hampiran dan teori kualitatif, teori kewujudan dan keunikan penyelesaian persamaan pembezaan biasa, dan teori Sturm-Liouville. Teori persamaan pembezaan matriks dan konsep matriks asasi dibangunkan. Konsep kestabilan dalam satah dan telatah penyelesaian persamaan pembezaan menggunakan kaedah Langsung Liapunov turut dibincangkan.

This course covers pure quantitative theory, approximate quantitative theory and qualitative theory, theory of existence and uniqueness of solutions of ordinary differential equations. The theory of matrix differential equation and concept of fundamental matrices are developed. The concept of stability in the plane and the behaviour of the solutions of the differential equations is investigated using Liapunov's direct method are discussed.

MTH4105 Teori Persamaan Kamiran/ *Theory Of Integral Equations* 3(3+0)

Prasyarat : MTH3102, MTH3301

Kursus ini merangkumi persamaan kemahiran linear dengan perbincangan ringks mengenai persamaan kemahiran mudah tak linear. Tajuk yang dibincangkan termasuklah klasifikasi persamaan kamiran, pertaliannya dengan persamaan pembezaan yang merangkumi masalah nilai awal dan masalah nilai sempadan. Penyelesaian menggunakan penghampiran berturutan dan persamaan leraian, teori Fredholm dan teori Hilbert Schmidt dibincangkan.

The course covers linear integral equations with a brief discussion on simple non-linear equations. Topics discussed include the classification of integral equations, connection with differential equations which consist of initial value problems and boundary value problems. Solution by method of successive approximations and resolvent equations, Fredholm theory and Hilbert-Schmidt theorem are discussed.

MTH4106 Persamaan Pembezaan Separa/ *Partial Differential Equations* 3(3+0)

Prasyarat : MTH3104, MTH3301

Kursus ini merangkumi teori persamaan pembezaan separa dan kaedah untuk menyelesaikan. Persamaan pembezaan separa peringkat satu dan dua, serta bagaimana persamaan pembezaan separa digunakan dalam permasalahan fizik dibincangkan.

The course covers the theory of partial differential equations and methods for solution. First order and second order partial differential equations, how the partial differential equations are used in physical problems are discussed.

MTH4201 Aljabar Niskala/ *Abstract Algebra* 3(3+0)

Prasyarat : MTH3202

Kursus ini merangkumi konsep set, fungsi, set integer kekongruenan, kumpulan, gelanggang dan hasil darab termasuk terus kumpulan. Teori unggunan, operasi atas unggunan, beberapa jenis gelanggang, medan dan lanjutannya turut dibincangkan.

This course covers concepts related to set, functions, the set of integers and congruences, groups and rings including the related theories and followed by direct product of groups. Theory of ideals, operation on ideals, several types of rings, fields and their extensions are discussed.





MTH4202 Teori Nombor/ *Number Theory* 3(3+0)

Prasyarat : MTH3101, MTH3202

Kursus ini merangkumi kebolehbahagian nombor integer, takrifan dan kegunaan pembahagi terbesar sepunya, kekongruenan dan kesalingan kuadrat. Penyelesaian persamaan Diofantus, teori nombor aljabar dan transenden dan penggunaannya dalam bidang kriptografi turut dibincangkan.

This course covers the divisibility of integers, definition and applications of greatest common divisor, congruence and quadratic reciprocity. This is followed by the solution of Diophantine equations. The algebraic and transcendental number theory and its applications in cryptography are discussed.

MTH4203 Pengenalan Kepada Teori Graf/ *Introduction To Graph Theory* 3(3+0)

Prasyarat : MTH3202

Kursus ini mencakupi graf Euler dan Hamilton serta penggunaannya. Pokok, kesatahan dan kedualan graf, nombor kromatik, mewarna peta dan pinggir, digraf, teorem Hall, teorem Menger dan penggunaannya.

This course covers Eulerian and Hamiltonian graphs and their applications. This is followed by trees, planar and dual graphs, chromatic number, map and edge colouring, diagraphs, Hall's theorem, Menger's theorem and their applications.

MTH4204 Kombinatorik/*Combinatorics* 3(3+0)

Prasyarat : MTH3202

Kursus ini meliputi pengangkaan termasuk pilihatur dan gabungan, prinsip rangkuman dan tak rangkuman, persamaan linear berpekali unit, hubungan jadisemula dan fungsi penjana. Ini diikuti dengan kewujudan termasuk kaedah pembuktian, geometri satah, peta di atas sfera, masalah pewarnaan dan struktur terhingga, kebarangkalian, percabangan teorem binomial, beberapa fungsi penjana dan persamaan beza, jujukan dan susunan Fibonacci turut dibincangkan.

This course covers enumeration including permutations and combinations, inclusion and exclusion principles, linear equations with unit coefficients, recursive relations and generating functions. This is followed by existence including methods of proofs, plane geometry, map on a sphere, colouring problems and finite structures. Probabilities, ramifications of binomial theorem, some generating functions and difference equations, Fibonacci sequences and arrangements are discussed.

MTH4205 Kriptografi Bermatematik/*Mathematical Cryptography* 3(3+0)

Prasyarat : MTH3202

Kursus ini merangkumi konsep teori kebarangkalian, teori informasi, teori kompleksiti, teori nombor, aljabar abstrak dan gelanggang terhingga. Konsep-konsep tersebut digunakan untuk memahami idea masalah log diskrit, kekuatan algoritma, keselamatan maklumat, enkripsi, dekripsi, sistem simetrik, asimetrik, dan analisis kriptografi dalam kriptografi. Sistem kripto simetrik dan asimetrik dan teori matematik kriptografi yang berkaitan juga ditekankan.

This course covers the probability theory concept, information theory, complexity theory, number theory, abstract algebra and finite fields. The symmetric and asymmetric cryptosystems and related cryptographical mathematical theory are also emphasized.





MTH4301 Topologi/Topology

3(3+0)

Prasyarat : MTH3301

Kursus ini mencakupi konsep ruang, fungsi selanjur, set, kekardinalan set dan jenis set termasuk set terbuka dan tertutup. Ini diikuti dengan jujukan dalam ruang topologi lemah dan kukuh, kekaitan, beberapa aksiom kekaitan dan jenis topologi. Teorem Lindeloff, Tychnoff dan Baire, ruang fungsi, ruang metrik dibincangkan.

This course covers concept of space, continuous function, set, cardinality of sets and types of sets which include open and closed sets. This is followed by sequences in space, weak and strong topologies, connectedness, axioms of connectedness, and types of topologies. The Lindeloff, Tychnoff and Baire theorems, function, metric, and Baire spaces are discussed.

MTH4302 Analisis Fungsian/Functional Analysis

3(3+0)

Prasyarat : MTH3201, MTH3301

Kursus ini merangkumi ruang metrik, ruang linear bernorma, ruang metrik padat, fungsian linear terbatas, ruang Hilbert, pengoperasi linear terbatas di atas ruang Hilbert dan teori spektrum bagi pengoperasi adjoin padat.

This course covers metric space, normed linear space, compact metric space, bounded linear functional, Hilbert space, bounded linear operators on Hilbert space and spectrum theory for compact adjoint operators.

MTH 4401 Teknik Tinjauan/ Survey Techniques

3(3+0)

Prasyarat : MTH3403

Kursus ini merangkumi pelbagai teknik tinjauan yang sering digunakan dan aplikasinya. Pensampelan rawak mudah, berstrata, bersistematik, berkelompok anggaran nisbah, anggaran regresi dan kepincangan dalam pensampelan dibincangkan.

This course covers the various survey techniques commonly used and their applications. Simple random sampling, stratified sampling, systematic sampling, cluster sampling, ratio and regression estimations and bias in sampling are discussed

MTH4403 Statistik Tak Berparameter/ Nonparametric Statistics

(3+0)

Prasyarat : MTH3403 dan MTH3404

Kursus ini merangkumi kaedah tak berparameter di mana andaian seperti kenormalan populasi dari mana sampel diambil digugurkan. Perbandingan di antara kaedah tak berparameter dengan kaedah berparameter, statistik tertib dan taburan kebarangkaliannya (tercantum dan sut) ditekankan. Ujian rawakan, masalah lokasi bagi sampel merdeka dan berkait, masalah kebagusan penyuaian, sukatan sekutuan dan kaedah Bootstrap tak berparameter dibincangkan.

This course covers nonparametric methods in which the assumption such as normality of the population from where the sample is obtained is dropped. Comparison between the nonparametric and parametric methods, order statistics and their distributions (joint and marginal) are emphasized. Test for randomness, location problems for independent and related samples, problem on the goodness of fit, measure of association and nonparametric Bootstrap methods are discussed.

MTH4404 Proses Stokastik/ Stochastic Processes

3(3+0)

Prasyarat : MTH3402, MTH3102

Kursus ini merangkumi beberapa jenis proses diskrit dan selanjur dengan penekanan diberi kepada rantai Markov dan perjalanan rawak.

This course covers several types of discrete and continuous processes with emphasize given on Markov chains and random walks.





MTH 4405 Pengenalan kepada Analisis Multivariat/ *An Introduction To Multivariate Analysis* 3(3+0)

Prasyarat : MTH3405

Kursus ini merangkumi sifat asas bagi vektor rawak, teori taburan normal, penganggaran dan ujian hipotesis. Topik yang melibatkan analisis beberapa masalah multivariat dibincang.

This course covers the basic properties of random vectors, normal distribution theory, estimation and hypothesis. Topics involving analysis of several multivariate problems are discussed.

MTH4406 Siri Masa/ *Time Series* 3(3+0)

Prasyarat : MTH3404

Kursus ini merangkumi penganggaran trend dan pola bermusim, proses pegun dan proses ARMA. Pengenalpastian, anggaran, diagnosis dan ujian rawakan, kriteria pemilihan, peramalan siri masa pegun, beberapa algoritma dan model pola bermusim bersifat darab dibincangkan.

This course covers estimation of trend and seasonal patterns, stationary and ARMA processes. Identification, estimation, diagnostic and randomness test, order forecasting stationary time series, several algorithms and multiplicative seasonal models are discussed.

MTH4407 Kaedah Interaktif Berkomputasi dalam Analisis Data/ *Interactive Computational Methods In Data Analysis* 3(3+0)

Prasyarat : MTH3405

Kursus ini merangkumi penganalisan dan pentafsiran output daripada pakej berstatistik terpilih. Transformasi dalam model berstatistik, data terpencil, simulasi berstatistik dan kegunaan varians serta kajian kes secara berkumpulan ke atas contoh berkaitan dibincangkan.

The course covers analyses and interpretations of output from selected statistical package. Transformations in statistical models, outliers, statistical simulations, and applications of variance as well as group case studies on related examples are discussed.

MTH4501 Tajuk Pilihan dalam Analisis Berangka/ *Selected Topics In Numerical Analysis* 3(3+0)

Prasyarat : MTH3501

Kursus ini merangkumi nama terkini dalam analisis berangka.

This course covers the current topics in numerical analysis.

MTH4502 Teori Penghampiran/ *Approximation Theory* 3(3+0)

Prasyarat : MTH3602

Kursus ini merangkumi kewujudan dan keunikan suatu penghampiran umum, dan penghampiran terbaik dalam norma seragam. Pembentukan penghampiran menggunakan polinomial ortogon dan penghampiran menggunakan fungsi nisbah dibincangkan.

This course covers the existence and uniqueness of approximations, and the best approximation in the uniform norm. This is followed by the constructions of the approximations using orthogonal polynomials and the approximation using rational functions.

MTH4602 Kawalan Optimum/ *Optimal Control* 3(3+0)

Prasyarat : MTH3104

Kursus ini merangkumi analisis dan rekabentuk sistem dinamik yang rumit. Teori kawalan optimum, pengaturcaraan dinamik, prinsip Pontryagin dan sistem kawalan linear dibincangkan.

This course covers the analysis and design of complicated dynamic systems. The optimal control theory, dynamic programming, Pontryagin's principles and linear control systems are discussed.





MTH4603 *Pengenalan kepada Penyelidikan Operasi/ Introduction To Operations Research* 3(3+0)

Prasyarat : MTH3602

Kursus ini merangkumi pengaturcaraan kuadratik dan stokastik, teori menunggu, masalah inventori, pengoptimuman dan analisis laluan kritikal.

This course covers quadratic and stochastic programming, queueing theory, inventory problems, optimization and critical path analysis.

MTH4604 Teknik Pengoptimuman/ *Optimization Techniques* 3(3+0)

Prasyarat : MTH3104, MTH3201

Kursus ini merangkumi teori permulaan yang menjadi asas kepada teknik pengoptimuman terkini. Konsep teori yang mendalam dan penggunaan sebenar teknik pengoptimuman ditekankan.

This course covers an elementary theory on which the current optimization techniques are based. The detail theoretical concepts and the actual application of optimization techniques are emphasized..

MTH4605 *Pengenalan Kepada Teori Kawalan/ Introduction To Control Theory* 3(3+0)

Prasyarat : MTH3104, MTH3302

Kursus ini merangkumi pendekatan baru dan terkini teori kawalan linear klasik, pengetahuan asas bagi analisis dan rekabentuk automatik atau gelung tertutup sistem kawalan.

This course covers a new and current approach on classical linear control theory, basic knowledge of analysis and automatic design, or closed loop of control systems.

MTH4606 Tajuk Khas dalam Matematik Gunaan/ *Special Topics In Applied Mathematics* 3(3+0)

Prasyarat : MTH3104

Kursus ini membincangkan nama terkini dalam matematik gunaan.

The course discussed the current topics in applied mathematics.

MTH4800 Sejarah Matematik/*History Of Mathematics* (3+0)

Prasyarat : MTH3101

Kursus ini merangkumi pembentukan ide matematik yang melibatkan teori matematik moden. Aspek kualitatif dan kuantitatif berdasarkan perspektif sejarah, pembentukan sejarah dalam cabang penting matematik termasuklah teori nombor, aljabar, geometri dan logik dibincangkan.

The course covers the development of mathematical ideas which is related to the theory of modern mathematics. Both qualitative and quantitative aspects based on historical perspective, historical developement in some important branches of mathematics including number theory, algebra, geometry and logic is discussed.

MTH4901 Latihan Industri/*Industrial Training* 4(0+4)

Prasyarat : Dengan kebenaran Jabatan/ *With permission of department*

Kursus ini meliputi latihan industri selama 8 minggu di agensi kerajaan atau beberapa syarikat atau kilang industri yang terpilih. Latihan dikendalikan bersama oleh penyelaras dan seorang penyelia atau pengurus dari agensi atau syarikat atau kilang tersebut.

This course covers an industrial training for a period of 8 week at various selected government agencies, companies or factories. The training is organized jointly by the coordinator and supervisor or the manager from the related agencies, company or factory.





MTH4999

Projek Ilmiah Tahun Akhir/ *Final Year Academic Project*

6(0+6)

Prasyarat : MTH3901

Kursus ini merangkumi sorotan bahan rujukan, penggunaan teknik penyelidikan yang sesuai, pengumpulan dan analisis data, penafsiran keputusan, perbincangan dan kesimpulan kajian saintifik dalam projek penyelidikan atau projek multimedia.

This course covers literature review, use of appropriate research techniques, data collection and analyses, interpretation of results, discussion and conclusion of scientific studies in research or multimedia project.





KURSUS TAWARAN FAKULTI LAIN
(Sila rujuk sinopsis pada fakulti berkenaan)

1. FAKULTI PERTANIAN

1.1	PRT2008	Pertanian dan Manusia/ <i>Agriculture and Man</i>	2 (2+0)
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2. FAKULTI EKOLOGI MANUSIA

2.1	SKP2101	Kenegaraan Malaysia/ <i>Malaysian Nationhood</i>	3 (3+0)
2.2	SKP2203	Tamadun Islam Dan Tamadun Asia/ <i>Islamic Civilization And Asian Civilization</i>	2 (2+0)
2.3	SKP2204	Hubungan Etnik/ <i>Ethnic Relations</i>	2 (2+0)
2.4	FEM3301	Etika Dan Nilai Dalam Pembangunan/ <i>Ethics And Values In Development</i>	3 (3+0)

3. FAKULTI BAHASA MODEN DAN KOMUNIKASI

3.1	BBI2420	Oral Interaction Skills	3 (2+1)
3.2	BBI2421	General Writing Skills	3 (2+1)
3.3	KOM3403	Pengucapan Awam/ <i>Public Oration</i>	3 (3+0)
3.4	BB* 240*	Bahasa Asing Tahap I/ <i>Foreign Language Level I</i>	3 (3+0)
3.5	BB* 240*	Bahasa Asing Tahap II/ <i>Foreign Language Level II</i>	3 (3+0)

4. FAKULTI EKONOMI DAN PENGURUSAN

4.1	MGM3180	Asas Keusahawanan/ <i>Basic Entrepreneurship</i>	3 (2+1)
4.2	ECN3100	Prinsip Ekonomi/ <i>Principles Of Economics</i>	3 (3+0)
4.3	ECN3161	Ekonomi Malaysia/ <i>Malaysian Economics</i>	3 (3+0)
4.4	ECN3101	Mikroekonomi/ <i>Microeconomics</i>	3 (3+0)
4.5	ECN3102	Makroekonomi/ <i>Macroeconomics</i>	3 (3+0)
4.6	ECN4181	Ekonomi Antarabangsa/ <i>International Economics</i>	3 (3+0)
4.7	ECN3111	Sejarah Pemikiran Ekonomi/ <i>History Of Economics Thought</i>	3 (3+0)
4.8	ACT2112	Perakaunan Pengenalan/ <i>Introductory Accounting</i>	4 (3+1)
4.9	ACT2131	Perakaunan Kos dan Pengurusan/ <i>Cost And Management Accounting</i>	3 (3+0)
4.10	ACT3121	Perakaunan Kewangan Pertengahan/ <i>Intermediate Financial Accounting</i>	3 (3+0)
4.11	ACT3122	Perakaunan Kewangan Pertengahan II/ <i>Intermediate Financial Accounting II</i>	3 (3+0)

5. FAKULTI PENGAJIAN ALAM SEKITAR

5.1	EMG3001	Manusia Dan alam Sekitar	3 (3+0)
5.2	FSA3000	Falsafah Sains	2 (2+0)

6. FAKULTI SAINS TEKNOLOGI MAKLUMAT

6.1	SSK3000	Teknologi Maklumat Dan Penggunaanya	3 (2+1)
6.2	SKM2300	Pengenalan Kepada Multimedia	3 (2+1)
6.3	SSK3100	Pengaturcaraan Komputer I	3 (2+1)
6.4	SSK3101	Pengaturcaraan Komputer II	3 (2+1)





7. FAKULTI PENGAJIAN PENDIDIKAN

7.1	FCE3204	Kemahiran Berfikir/ <i>Thinking Skills</i>	2 (2+0)
7.2	FCE3004	Pengenalan Kepada Falsafah/ <i>Introduction of Philosophy</i>	2 (2+0)
7.3	FCE3100	Falsafah dan Konsep Pendidikan/ <i>Philosophy and Concept Of Education</i>	2 (2+0)
7.4	FCE3200	Psikologi Pendidikan/ <i>Educational Phychology</i>	3 (3+0)
7.5	FCE3300	Sosiologi Pendidikan/ <i>Sociology of Education</i>	2 (2+0)
7.6	FCE3400	Teknologi Pendidikan/ <i>Educational Technology</i>	3 (2+1)
7.7	FCE3500	Pengujian dan Penilaian/ <i>Testing and Evaluation</i>	3 (2+1)
7.8	FCE3900	Penyelidikan Pendidikan/ <i>Educational Research</i>	3 (2+1)
7.9	FCE3000	Kokurikulum/ <i>Co-Curriculum</i>	3 (2+1)
7.10	FCE3101	Etika dan Profesionalisme Keguruan/ <i>Ethics and Teaching Professionalism</i>	3 (2+1)
7.11	STE5301	Kaedah Mengajar Fizik/ <i>Physic Teaching Method</i>	2 (2+0)
7.12	FCE3801	Latihan Mengajar Bidang Major/ <i>Teaching Practice in Major Field</i>	3 (2+1)
7.13	FCE3802	Latihan Mengajar Tumpuan Kedua/ <i>Teaching Practice for Second Option</i>	4 (4+0)
7.14	STE3504	Pengurusan Makmal Sains/ <i>Management of Science Laboratory</i>	3 (2+1)
7.15	STE3400/ STE3500/ STE3502/ STE3503/ STE3700	Kaedah Mengajar Tumpuan Kedua/ <i>Teaching Methods for Second Option</i> (Matematik/ Sains Komputer dan Teknologi Maklumat/ Perakaunan/ Ekonomi/ Biologi)	3 (2+1)
7.16	STE3502	Kaedah Mengajar Fizik/ <i>Teaching Methods for Physic</i>	3 (2+1)
7.17	STE3503	Kaedah Mengajar Kimia/ <i>Teaching Methods for Chemical</i>	3 (2+1)
7.18	STE3300/ STE3303/ STE3501	Perakaunan/Accounting/ Ekonomi/Economic/ Biologi/ Biology	3 (2+1)

Nota/Notes : *STE 3400/3500/3501/3502/3503/3300/3303/3700 (Kaedah Mengajar Tumpuan Kedua (Minor))*STE 3400/3500/3501/3502/3503/3300/3303/3700 (Second Option (Minor) Teaching Method





ELEx SCHEME FOR 4 YEARS PROGRAMMES FROM SEPTEMBER 2013

MUET Band	Graduation Requirements for 4-year programmes
1 & 2	3 BBI + 3 CEL + 24 LAX points
3 & 4	2 BBI + 2 CEL + 36 LAX points
5 & 6	3 CEL + 36 LAX points

Sem	4 - Years Programme					
	MUET 1 & 2		MUET3 & 4		MUET 5 & 6	
Sem 1	BBI2422	CEL101	CEL102	LAX	LAX	
Sem 2	LAX	CEL102	BBI2423		CEL103	
Sem 3	BBI2423		BBI2424		LAX	
Sem 4	BBI2424		LAX		Choose ONE : CEL104/105	
Sem 5	LAX		LAX		LAX	
Sem 6	Choose ONE : CEL105/106/107		Choose ONE : CEL105/106/107		LAX	
Sem 7	LAX		LAX		Choose ONE : CEL105/106/107	
Sem 8	LAX <i>or</i>	OPTIONS : CEL104/105/106/107	LAX <i>or</i>	OPTIONS : CEL104/105/106/107	LAX <i>or</i>	OPTIONS : CEL104/105/106/107

Note :

Students who are away on Industrial Training in any semester need not enroll in any course or LAX for that particular semester, but they must enroll in a course LAX in subsequent semesters.

BBI courses

- BBI2422 (Reading for Academic Purpose)
- BBI2423 (Academic Interaction and Presentation)
- BBI2424 (Academic Writing)

CEL courses

- CEL101 (Vocabulary and Grammar for Communication)
- CEL102 (Effective Listening and Speaking)
- CEL103 (Writing Academic Texts)
- CEL104 (Oral Presentation)
- CEL105 (Spoken Communication for the Workplace)
- CEL106 (Communication for Professional Development)
- CEL107 (Written Business Communication)

LAX

- LAX (6 points or 12 points)
- 1 point = 2 hours per week





Pre-requisites for courses

- CEL102 : Level 2 in CEL101 or MUET Band 5-6
- CEL103 : Passed BBI2424 or MUET Band 5 - 6
- BBI2423 : Level 2 in CEL102
- BBI2424 : Passed BBI2423
- CE2104,105,106,107 :Passed BBI2424 or MUET Band 5 – 6

