FACULTY OF SCIENCE

Undergraduate Programmes Offered :

Bachelor Programme

1. *Bachelor of Science in Biology with Honours*
2. *Bachelor of Science in Physics with Honours*
3. *Bachelor of Science with Honours in Material Science*
4. *Bachelor of Science with Honours in Instrumentation Science*
5. *Bachelor of Science in Chemistry with Honours*
6. *Bachelor of Science in Petroleum Chemistry with Honours*
7. *Bachelor of Science in Industrial Chemistry with Honours*
8. *Bachelor of Science in Mathematics with Honours*
9. *Bachelor of Science in* Statistics *with Honours*
10. *Bachelor of Science in Biology with Education (Honours)*
11. *Bachelor of Science in Physics with Education (Honours)*
12. *Bachelor of Science in Chemistry with Education (Honours)*
13. *Bachelor of Science in Mathematics with Education (Honours)*
14. *Bachelor of Science in Statistics with Education (Honours)*

STUDY SCHEME (BACHELOR OF SCIENCE IN BIOLOGY WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY3002	*Cell and Molecular Biology*	*2*	*1*
BGY3100	*Biology of Microorganisms*	*2*	*1*
FCE3204	*Thinking Skills*	*2*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
	TOTAL	***12***	***2***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY3103	*Plant Diversity*	*3*	*1*
BGY3104	*Animal Diversity*	*3*	*1*
BGY3201	*Plant Structure And Function*	*2*	*1*
BBI2424	*Academic Writing*	*2*	*1*
	Elective		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3201	*Organic Chemistry I*	*3*	*1*
BGY3302	*Animal Physiology*	*3*	*1*
BGY4902	*Research Methodology and Fieldwork in Biology*	*1*	*2*
	Elective		
BGY4XXX	*Department Elective*	*3*	*1*
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY4959B	*Bachelor Dissertation*	*0*	*3*
BGY4XXX	*Department Elective*	*3*	*1*
BGY4XXX	*Department Elective*	*2*	*1*
BGY4XXX	*Department Elective*	*2*	*1*
	TOTAL	***7***	***6***

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY3003	*Developmental Biology*	*2*	*1*
BGY3004	*Evolutionary Biology*	*2*	*0*
BGY3401	*Ecology*	*2*	*1*
SLP2101	*Malaysian Nationhood*	*3*	*0*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
	Elective		
QLXxxxx	*Co-Curriculum*	*0*	*1*
	TOTAL		

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY3202	*Animal Structure and Function*	*2*	*1*
BGY3301	*Plant Physiology*	*3*	*1*
BGY3501	*Genetics*	*3*	*1*
BGY4XXX	*Department Elective*	*3*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*
	TOTAL	***13***	***6***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY3701	*Biostatistics*	*2*	*1*
BGY4959A	*Bachelor Dissertation*	*0*	*3*
LOM3403	*Public Oration*	*3*	*0*
BGY4XXX	*Department Elective*	*3*	*1*
BGY4XXX	*Department Elective*	*2*	*1*
	TOTAL	***10***	***6***

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BGY4903	*Industrial Training*	*0*	*8*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN PHYSICS WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1				***SEMESTER 2***			
CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY3103	*Physics I*	*3*	*1*	*PHY3104*	*Physics II*	*3*	*1*
MTH3100	*Calculus*	*3*	*0*	*MTH3200*	*Algebra*	*3*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*	*PRT2008*	*Agriculture and Man*	*2*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*	*BBI2423*	*Academic Interaction and Presentation*	*2*	*1*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*	*LOM3403*	*Public Oration*	*3*	*0*
FCE3204	*Thinking Skills*	*2*	*0*	*QLXxxxx*	*Co-Curriculum*	*0*	*1*
	TOTAL	***15***	***1***		***TOTAL***	***13***	***3***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY3105	*Modern Physics*	*3*	*0*	*PHY3201*	*Solid State Physics*	*3*	*0*
PHY3604	*Mathematical Methods in Physics*	*3*	*0*	*PHY3401*	*Electromagnetism*	*3*	*0*
MTH3102	*Differential Equations*	*3*	*0*	*PHY3601*	*Quantum Mechanics*	*3*	*0*
PHY3306	*Electronics*	*3*	*1*	*PHY4403*	*Geometrical and Wave Optics*	*3*	*0*
BBI2424	*Academic Writing*	*2*	*1*	*MGM3180*	*Basic Entrepreneurship*	*2*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*		*Elective*		
	TOTAL	***14***	***3***		***TOTAL***		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY3602	*Statistical Mechanics*	*3*	*0*	*PHY4959A*	*Bachelor Dissertation*	*0*	*3*
PHY3603	*Classical Mechanics*	*3*	*0*		*Elective*		
SSL3100	*Computer Programming I*	*3*	*1*		***TOTAL***		
PHY4995	*Advanced Physics Practicals*	*0*	*3*				
	Elective						
	TOTAL						

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY4959B	*Bachelor Dissertation*	*0*	*3*	*PHY4903*	*Industrial Training*	*0*	*8*
	Elective				***TOTAL***	***0***	***8***
	TOTAL						

STUDY SCHEME (BACHELOR OF SCIENCE WITH HONOURS IN MATERIALS SCIENCE)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1				*SEMESTER 2*			
CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY3103	*Physics I*	*3*	*1*	*PHY3104*	*Physics II*	*3*	*1*
MTH3100	*Calculus*	*3*	*0*	*MTH3200*	*Algebra*	*3*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*	*PRT2008*	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*	*BBI2423*	*Academic Interaction and Presentation*	*2*	*1*
SLP2204	*Ethnic Relations*	*2*	*0*	*LOM3403*	*Public Oration*	*3*	*0*
FCE3204	*Thinking Skills*	*2*	*0*	*QLXxxxx*	*Co-Curriculum*	*0*	*1*
	TOTAL	***15***	***1***		***TOTAL***	***13***	***3***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY3105	*Modern Physics*	*3*	*0*	*PHY3208*	*Magnetism and Magnetic Materials*	*3*	*0*
PHY3201	*Solid State Physics*	*3*	*0*	*PHY3209*	*Thermodynamics*	*3*	*0*
PHY3401	*Electromagnetism*	*3*	*0*	*PHY3306*	*Electronics*	*3*	*1*
PHY4403	*Geometrical and Wave Optics*	*3*	*0*	*PHY4204*	*Analytical Methods of Structure and Microstructure*	*3*	*1*
BBI2424	*Academic Writing*	*2*	*1*	*MGM3180*	*Basic Entrepreneurship*	*2*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*		***TOTAL***	***14***	***2***
	Elective						
	TOTAL						

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY4206	*Metals and Alloys*	*3*	*1*	*PHY4959A*	*Bachelor Dissertation*	*0*	*3*
SSL3100	*Computer Programming I*	*3*	*1*	*PHY4205*	*Ceramics and Polymer*	*3*	*1*
	Elective				*Elective*		
	TOTAL				***TOTAL***		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
PHY4959B	*Bachelor Dissertation*	*0*	*3*	*PHY4903*	*Industrial Training*	*0*	*8*
	Elective				***TOTAL***	***0***	***8***
	TOTAL						

STUDY SCHEME (BACHELOR OF SCIENCE WITH HONOURS IN INSTRUMENTATION SCIENCE)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
PHY3104	*Physics II*	*3*	*1*
MTH3100	*Calculus*	*3*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
FCE3204	*Thinking Skills*	*2*	*0*
	TOTAL	***15***	***1***

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
PHY3103	*Physics I*	*3*	*1*
MTH3200	*Algebra*	*3*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
LOM3403	*Public Oration*	*3*	*0*
QLXxxxx	*Co-Curriculum*	*0*	*1*
	TOTAL	***13***	***3***

2ND YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
PHY3105	*Modern Physics*	*3*	*0*
PHY4403	*Geometrical and Wave Optics*	*3*	*0*
PHY3401	*Electromagnetism*	*3*	*0*
PHY3306	*Electronics*	*3*	*1*
BBI2424	*Academic Writing*	*2*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*
	TOTAL	***14***	***3***

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
PHY3303	*Sensors and Transducers*	*3*	*1*
PHY3304	*Principle of Measurement System*	*3*	*1*
PHY4301	*Microprocessor and microcomputer*	*3*	*0*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
	Elective		
	TOTAL		

3RD YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
PHY4303	*Computer Interfacing and Control*	*3*	*1*
SSL3100	*Computer Programming I*	*3*	*1*
	Elective		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
PHY4959A	*Bachelor Dissertation*	*0*	*3*
PHY4302	*Design of Electronic Equipment*	*3*	*1*
PHY4305	*Advanced Instrumentation*	*3*	*0*
	Elective		
	TOTAL		

4TH YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
PHY4959B	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
PHY4903	*Industrial Training*	*0*	*8*
	TOTAL		

STUDY SCHEME (BACHELOR OF SCIENCE IN CHEMISTRY WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3100	*Basic Physical Chemistry*	*3*	*1*
CHM3011	*Basic Inorganic Chemistry*	*2*	*1*
MTH3100	*Calculus*	*3*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
	TOTAL	***15***	***2***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3301	*Inorganic Chemistry I*	*2*	*1*
CHM3401	*Analytical Chemistry*	*2*	*1*
BBI2424	*Academic Writing*	*2*	*1*
CHM3102	*Polymer Chemistry*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*
	Elective		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3701	*Computational Chemistry*	*3*	*1*
CHM3203	*Organic Chemistry III*	*2*	*1*
CHM3302	*Inorganic Chemistry II*	*2*	*1*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3104	*Chemical Thermodynamics*	*2*	*1*
CHM4959B	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3201	*Organic Chemistry I*	*3*	*1*
PHY3104	*Physics II*	*3*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
FCE3204	*Thinking Skills*	*2*	*0*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
QLXxxxx	*Co-curriculum*	*0*	*1*
	TOTAL	***12***	***5***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
LOM3403	*Public Oration*	*3*	*0*
CHM3202	*Organic Chemistry II*	*3*	*1*
CHM3402	*Chemical Spectroscopy*	*3*	*1*
CHM3101	*Physical Chemistry*	*3*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*
	Elective		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3103	*Chemical Linetics*	*2*	*1*
CHM4301	*Advanced Inorganic Chemistry*	*2*	*1*
CHM4959A	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4903	*Industrial Training*	*0*	*8*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN PETROLEUM CHEMISTRY WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3100	*Basic Physical Chemistry*	*3*	*1*
CHM3011	*Basic Inorganic Chemistry*	*2*	*1*
MTH3100	*Calculus*	*3*	*0*
SLP2203	*Islamic Civilization And Asian Civilization*	*2*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
	TOTAL	***14***	***2***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BBI2424	*Academic Writing*	*2*	*1*
CHM3202	*Organic Chemistry II*	*3*	*1*
CHM3301	*Inorganic Chemistry I*	*2*	*1*
CHM3401	*Analytical Chemistry*	*2*	*1*
SLP2101	*Malaysian Nationhood*	*3*	*0*
	TOTAL	***12***	***4***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3500	*Chemical Technology Principles*	*4*	*0*
CHM3602	*Petroleum Refining Processes*	*3*	*0*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4959B	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3201	*Organic Chemistry I*	*3*	*1*
PHY3104	*Physics II*	*3*	*1*
FCE3204	*Thinking Skills*	*2*	*0*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
LOM3403	*Public Oration*	*3*	*0*
QLXxxxx	*Co-curiculum*	*0*	*1*
	TOTAL	***13***	***4***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3101	*Physical Chemistry*	*3*	*1*
CHM3303	*Inorganic Chemistry III*	*2*	*1*
CHM3402	*Chemical Spectroscopy*	*3*	*1*
CHM3601	*Petroleum Chemistry*	*3*	*0*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*
	TOTAL	***13***	***5***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3603	*Petrochemicals*	*3*	*0*
CHM3604	*Oil Spill Control*	*3*	*0*
CHM4959A	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4903	*Industrial Training*	*0*	*8*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN INDUSTRIAL CHEMISTRY WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3100	*Basic Physical Chemistry*	*3*	*1*
CHM3011	*Basic Inorganic Chemistry*	*2*	*1*
MTH3100	*Calculus*	*3*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
FCE3204	*Thinking Skills*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
	TOTAL	***15***	***2***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3102	*Polymer Chemistry*	*2*	*1*
CHM3301	*Inorganic Chemistry I*	*2*	*1*
CHM3401	*Analytical Chemistry*	*2*	*1*
BBI2424	*Academic Writing*	*2*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*
	TOTAL	***12***	***5***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3303	*Inorganic Chemistry III*	*2*	*1*
CHM3402	*Chemical Spectroscopy*	*3*	*1*
CHM3503	*Industrial Polymer Chemistry*	*3*	*0*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4959B	*Bachelor Dissertation*	*0*	*3*
	Elective		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3201	*Organic Chemistry I*	*3*	*1*
PHY3104	*Physics II*	*3*	*1*
LOM3403	*Public Oration*	*3*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
QLXxxxx	*Co-curriculum*	*0*	*1*
	TOTAL	***13***	***4***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3101	*Physical Chemistry*	*3*	*1*
CHM3501	*Industrial Chemistry I*	*3*	*0*
CHM3202	*Organic Chemistry II*	*3*	*1*
QLL2101	*Bakti Siswa*	*0*	*1*
	Elective		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3500	*Chemical Technology Principles*	*4*	*0*
CHM4959A	*Bachelor Dissertation*	*0*	*3*
CHM3502	*Industrial Chemistry II*	*3*	*0*
	Elective		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4903	*Industrial Training*	*0*	*8*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN MATHEMATICS WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1				*SEMESTER 2*			
CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
MTH3100	*Calculus*	*3*	*0*	*MTH3401*	*Probability and Statistics I*	*3*	*0*
MTH3200	*Algebra*	*3*	*0*	*MTH3101*	*Advanced Calculus*	*3*	*0*
	Group lI Elective				*Group lI Elective*		
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*	*SLP2204*	*Ethnic Relations*	*2*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*	*BBI2423*	*Academic Interaction and Presentation*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*	*MGM3180*	*Basic Enterpreneurship*	*2*	*1*
	TOTAL			*QLXxxxx*	*Co-curriculum*	*0*	*1*
					TOTAL		

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
MTH3102	*Differential Equations*	*3*	*0*	*MTH3103*	*Vector Analysis*	*3*	*0*
MTH3201	*Linear Algebra*	*3*	*0*	*MTH3202*	*Introduction to Modern Algebra*	*3*	*0*
MTH3402	*Probability and Statistics II*	*3*	*0*	*MTH3301*	*Real Analysis*	*3*	*0*
MTH3701	*Financial Mathematics*	*3*	*0*	*MTH3500*	*Computer Programming in Mathematics*	*3*	*1*
	Group Il Elective			*LOM3403*	*Public Oration*	*3*	*0*
BBI2424	*Academic Writing*	*2*	*1*	*FCE3204*	*Thinking Skills*	*2*	*0*
QLL2101	*Bakti Siswa*	*0*	*1*		***TOTAL***	***17***	***1***
	TOTAL						

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
MTH3104	*Mathematical Methods*	*3*	*0*	*MTH4959A*	*Bachelor Dissertation*	*0*	*3*
MTH3302	*Complex Analysis*	*3*	*0*	*MTH3406*	*Statistical Quality Control*	*3*	*0*
MTH3501	*Numerical Analysis*	*3*	*0*	*MTH4xxx*	*Group I Elective*		
MTH3602	*Mathematical Programming*	*3*	*0*		*Group Il Elective*		
MTH3901	*Research Processes in Mathematics and Statistics*	*1*	*2*		***TOTAL***		
	Group III Elective						
	TOTAL						

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*	*CODE*	*COURSE NAME*	*L*	*L/T*
MTH4959B	*Bachelor Dissertation*	*0*	*3*	*MTH4903*	*Industrial Training*	*0*	*8*
MTH 4xxx	*Group l Elective*				***TOTAL***	***0***	***8***
	Group lV Elective						
	TOTAL	***0***	***3***				

STUDY SCHEME (BACHELOR OF SCIENCE IN STATISTICS WITH HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3100	*Calculus*	*3*	*0*
MTH3200	*Algebra*	*3*	*0*
	Elective Group I		
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
	TOTAL		

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3102	*Differential Equations*	*3*	*0*
MTH3201	*Linear Algebra*	*3*	*0*
MTH3402	*Probability and Statistics II*	*3*	*0*
MTH3500	*Computer Programming in Mathematics*	*3*	*1*
BBI2424	*Academic Writing*	*2*	*1*
	Elective Group l		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3404	*Linear Model*	*3*	*0*
MTH3408	*Introduction To Bayesian Method*	*3*	*0*
MTH3409	*Computational Statistics*	*2*	*1*
MTH3410	*Statistical Modelling and Inference*	*3*	*0*
MTH3901	*Research Processes in Mathematics and Statistics*	*1*	*2*
	Elective Group III		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH4959B	*Bachelor Dissertation*	*0*	*3*
MTH4XXX	*Elective Group II*		
	Elective Group IV		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3401	*Probability and Statistics I*	*3*	*0*
MTH3101	*Advanced Calculus*	*3*	*0*
	Elective Group I		
SLP2204	*Ethnic Relations*	*2*	*0*
BBI2423	*Academic Interaction and Presentation*	*3*	*0*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
QLXxxxx	*Co-curriculum*	*0*	*1*
	TOTAL		

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3403	*Experimental Design*	*3*	*0*
MTH3405	*Applications of Selected Statistical Package*	*2*	*1*
MTH3406	*Statistical Quality Control*	*3*	*0*
MTH3407	*Intermediate Probability*	*3*	*0*
LOM3403	*Public Oration*	*3*	*0*
FCE3204	*Thinking Skills*	*2*	*0*
QLL2101	*Bakti Siswa*	*0*	*1*
	TOTAL	***16***	***2***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH4959A	*Bachelor Dissertation*	*0*	*3*
MTH3411	*Regression Analysis*	*3*	*0*
MTH4XXX	*Elective Group II*		
	Elective Group I		
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH4903	*Industrial Training*	*0*	*8*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN BIOLOGY WITH EDUCATION-HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
BGY3002	*Cell and Molecular Biology*	*2*	*1*
BGY3100	*Biology of Microorganisms*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
FSA3000	*Philosophy of Science*	*2*	*0*
XXXxxx	*Open Elective*		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
SLP2101	*Malaysian Nationhood*	*3*	*0*
BGY3003	*Developmental Biology*	*2*	*1*
BGY3004	*Biology Evolution*	*2*	*0*
BGY3401	*Ecology*	*2*	*1*
QLU2203	*Volunteerism development*	*0*	*2*
	TOTAL		

2ND YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
BBI2424	*Academic Writing*	*2*	*1*
BGY3103	*Plant Diversity*	*3*	*1*
BGY3104	*Animal Diversity*	*3*	*1*
BGY3204	*Plant Structure and Physiology*	*3*	*1*
XXXxxx	*Open Elective*		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
BGY3501	*Genetics*	*3*	*1*
BGY3304	*Animal Structure and Physiology*	*3*	*1*
FCE3102	*Philosophy of Education*	*3*	*0*
FCE3803	*Curriculum Development*	*3*	*0*
FCE3804	*Early School Experience*	*0*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
	TOTAL		

3RD YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
BGY4902	*Research Methodology and Fieldwork in Biology*	*1*	*2*
*CHM3000**	*Principle of Chemistry*	*3*	*1*
FCE3200	*Educational Psychology*	*3*	*0*
FCE3302	*Sociology of Education*	*3*	*0*
FCE3401	*Educational Technology*	*2*	*1*
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
BGY3701	*Biostatistics*	*2*	*1*
BGY4959A	*Bachelor Dissertation*	*0*	*3*
*CHM3401**	*Analytical Chemistry*	*2*	*1*
FCE3001	*Co-curricular Management*	*2*	*1*
FCE3101	*Ethics and Teacher Professionalism*	*2*	*0*
STE4581	*Biology Teaching Method*	*2*	*1*
	TOTAL		

4TH YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
BGY4959B	*Bachelor Dissertation*	*0*	*3*
*CHM3010**	*Physical and Inorganic Chemistry*	*3*	*1*
FCE3501	*Learning Assessment*	*2*	*1*
STE3504	*Management of Science Laboratory*	*2*	*1*
STE4583	*Chemistry Teaching Method*	*2*	*1*
XXXxxx	*Open Elective*		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
FCE4809	*Teaching Practice in Major Field*	*0*	*4*
FCE4810	*Teaching Practice for Second Option*	*0*	*4*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN PHYSICS WITH EDUCATION-HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY3104	*Physics II*	*3*	*1*
MTH3100	*Calculus*	*3*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
FSA3000	*Philosophy of Science*	*2*	*0*
	TOTAL	***15***	***1***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY3105	*Modern Physics*	*3*	*0*
PHY3604	*Mathematical Methods in Physics*	*3*	*0*
BBI2424	*Academic Writing*	*2*	*1*
FCE3102	*Philosophy of Education*	*3*	*0*
FCE3804	*Early School Experience*	*0*	*1*
*MTH3102**	*Differential Equations*	*3*	*0*
	TOTAL	***14***	***2***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY3601	*Quantum Mechanics*	*3*	*0*
PHY3201	*Solid State Physics*	*3*	*0*
FCE3900	*Educational Research*	*3*	*0*
STE4582	*Physics Teaching Method*	*2*	*1*
FCE3101	*Ethics and Teacher Professionalism*	*2*	*0*
*MTH3500**	*Computer Programming in Mathematics*	*3*	*1*
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY4959B	*Bachelor Dissertation*	*0*	*3*
FCE3501	*Learning Assessment*	*2*	*1*
STE3504	*Management of Science Laboratory*	*2*	*1*
*STE4480**	*Mathematics Teaching Method*	*2*	*1*
XXXxxx	*Open Elective*		
	TOTAL	***6***	***6***

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY3103	*Physics I*	*3*	*1*
MTH3200	*Algebra*	*3*	*0*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*
QLU2203	*Volunteerism development*	*0*	*2*
	TOTAL	***12***	***5***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY4403	*Geometrical and Wave Optics*	*3*	*0*
PHY3306	*Electronics*	*3*	*1*
PHY3401	*Electromagnetism*	*3*	*0*
FCE3001	*Co-curricular Management*	*2*	*1*
XXXxxx	*Open Elective*		
	TOTAL	***11***	***2***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
PHY4959A	*Bachelor Dissertation*	*0*	*3*
PHY3209	*Thermodynamics*	*3*	*0*
FCE3200	*Educational Psychology*	*3*	*0*
FCE3401	*Educational Technology*	*2*	*1*
FCE3302	*Sociology of Education*	*3*	*0*
*MTH3401**	*Probability and Statistics I*	*3*	*0*
	TOTAL		

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE4809	*Teaching Practice in Major Field*	*0*	*4*
FCE4810	*Teaching Practice for Second Option*	*0*	*4*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN CHEMISTRY WITH EDUCATION-HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
MTH3100	*Calculus*	*3*	*0*
CHM3100	*Basic Physical Chemistry*	*3*	*1*
CHM3011	*Basic Inorganic Chemistry*	*2*	*1*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2204	*Ethnic Relations*	*2*	*0*
FSA3000	*Philosophy of Science*	*2*	*0*
	TOTAL	***16***	***2***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3401	*Analytical Chemistry*	*2*	*1*
CHM3301	*Inorganic Chemistry I*	*2*	*1*
CHM3202	*Organic Chemistry II*	*3*	*1*
BBI2424	*Academic Writing*	*2*	*1*
FCE3102	*Philosophy of Education*	*3*	*0*
FCE3803	*Curriculum Development*	*3*	*0*
FCE3804	*Early School Experience*	*0*	*1*
	TOTAL	***15***	***5***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3302	*Inorganic Chemistry II*	*2*	*1*
CHM3203	*Organic Chemistry III*	*2*	*1*
FCE3900	*Educational Research*	*3*	*0*
STE4583	*Chemistry Teaching Method*	*2*	*1*
FCE3101	*Ethics and Teacher Professionalism*	*2*	*0*
*PHY3105**	*Modern Physics*	*3*	*0*
	TOTAL	***14***	***3***

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4959B	*Bachelor Dissertation*	*0*	*3*
FCE3501	*Learning Assessment*	*2*	*1*
STE3504	*Management of Science Laboratory*	*2*	*1*
*STE4582**	*Physics Teaching Method*	*2*	*1*
CHMxxxx	*Elective*		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3201	*Organic Chemistry I*	*3*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
SLP2101	*Malaysian Nationhood*	*3*	*0*
QLU2203	*Volunteerism development*	*0*	*2*
*PHY3103**	*Physics I*	*3*	*1*
	TOTAL	***13***	***6***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM3101	*Physical Chemistry*	*3*	*1*
CHM3402	*Chemical Spectroscopy*	*3*	*1*
FCE3001	*Co-curricular Management*	*2*	*1*
*LP_2101**	*Basic Global Language*	*3*	*0*
*PHY3104**	*Physics II*	*3*	*1*
	TOTAL	***14***	***4***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
CHM4959A	*Bachelor Dissertation*	*0*	*3*
CHM3103	*Chemical Linetics*	*2*	*1*
FCE3200	*Educational Psychology*	*3*	*0*
FCE3401	*Educational Technology*	*2*	*1*
FCE3302	*Sociology of Education*	*3*	*0*
CHMxxxx	*Elective*		
	TOTAL	***10***	***5***

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE4809	*Teaching Practice in Major Field*	*0*	*4*
FCE4810	*Teaching Practice for Second Option*	*0*	*4*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN MATHEMATICS WITH EDUCATION-HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
FSA3000	*Philosophy of Science*	*2*	*0*
MTH3100	*Calculus*	*3*	*0*
MTH3200	*Algebra*	*3*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
	TOTAL	***15***	***0***

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
MTH3102	*Differential Equations*	*3*	*0*
MTH3201	*Linear Algebra*	*3*	*0*
MTH3401	*Probability and Statistics I*	*3*	*0*
QLU2203	*Volunteerism development*	*0*	*2*
SLP2204	*Ethnic Relations*	*2*	*0*
XXXxxx	*Open Elective*		
	TOTAL		

2ND YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
BBI2424	*Academic Writing*	*2*	*1*
MTH3101	*Advanced Calculus*	*3*	*0*
MTH3104	*Mathematical Methods*	*3*	*0*
MTH3500	*Computer Programming in Mathematics*	*3*	*1*
XXXxxx	*Open Elective*		
XXXxxx	*Open Elective*		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
FCE3803	*Curriculum Development*	*3*	*0*
FCE3804	*Early School Experience*	*0*	*1*
FCE3102	*Philosophy of Education*	*3*	*0*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
MTH3301	*Real Analysis*	*3*	*0*
MTH3202	*Introduction to Modern Algebra*	*3*	*0*
*BGY3000**	*Principle Biology*	*3*	*1*
	TOTAL	***17***	***3***

3RD YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
FCE3200	*Educational Psychology*	*3*	*0*
FCE3302	*Sociology of Education*	*3*	*0*
FCE3401	*Educational Technology*	*2*	*1*
MTH3501	*Numerical Analysis*	*3*	*0*
MTH3901	*Research Processes in Mathematics and Statistics*	*1*	*2*
*BGY3100**	*Biology of Microorganisms*	*2*	*1*
	TOTAL	***14***	***4***

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
FCE3001	*Co-curricular Management*	*2*	*1*
FCE3101	*Ethics and Teacher Professionalism*	*2*	*0*
STE4480	*Mathematics Teaching Method*	*2*	*1*
MTH3602	*Mathematical Programming*	*3*	*0*
MTH4959A	*Bachelor Dissertation*	*0*	*3*
*BGY3401**	*Ecology*	*2*	*1*
	TOTAL	***11***	***6***

4TH YEAR

SEMESTER 1

CODE	*COURSE NAME*	*L*	*L/T*
STE3504	*Management of Science Laboratory*	*2*	*1*
*STE4581**	*Biology Teaching Method*	*2*	*1*
FCE3501	*Learning Assessment*	*2*	*1*
MTH4959B	*Bachelor Dissertation*	*0*	*3*
XXXxxx	*Elective Group II*		
XXXxxx	*Elective Group II*		
	TOTAL		

SEMESTER 2

CODE	*COURSE NAME*	*L*	*L/T*
FCE4809	*Teaching Practice in Major Field*	*0*	*4*
FCE4810	*Teaching Practice for Second Option*	*0*	*4*
	TOTAL	***0***	***8***

STUDY SCHEME (BACHELOR OF SCIENCE IN STATISTICS WITH EDUCATION-HONOURS)

Notes : L = Lecture , L/T = Laboratory/Tutorial

SEMESTER 1

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FSA3000	*Philosophy of Science*	*2*	*0*
MTH3100	*Calculus*	*3*	*0*
MTH3200	*Algebra*	*3*	*0*
PRT2008	*Agriculture and Man*	*2*	*0*
SLP2203	*Islamic Civilization and Asian Civilization*	*2*	*0*
SLP2101	*Malaysian Nationhood*	*3*	*0*
	TOTAL	***15***	***0***

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BBI2424	*Academic Writing*	*2*	*1*
MTH3101	*Advanced Calculus*	*3*	*0*
MTH3402	*Probability and Statistics II*	*3*	*0*
MTH3403	*Experimental Design*	*3*	*0*
XXXxxx	*Open Elective*		
XXXxxx	*Open Elective*		
	TOTAL		

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE3200	*Educational Psychology*	*3*	*0*
FCE3302	*Sociology of Education*	*3*	*0*
FCE3401	*Educational Technology*	*2*	*1*
MTH3406	*Statistical Quality Control*	*3*	*0*
MTH3901	*Research Processes in Mathematics and Statistics*	*1*	*2*
*PHY3104**	*Physics II*	*3*	*1*
	TOTAL	***15***	***4***

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE3501	*Learning Assessment*	*2*	*1*
STE3504	*Management of Science Laboratory*	*2*	*1*
STE458X	*Teaching Method*	*2*	*1*
MTH4959B	*Bachelor Dissertation*	*0*	*3*
XXXxxx	*EleLtive Group II*		
XXXxxx	*EleLtive Group II*		
	TOTAL		

SEMESTER 2

1ST YEAR

CODE	*COURSE NAME*	*L*	*L/T*
BBI2423	*Academic Interaction and Presentation*	*2*	*1*
MTH3102	*Differential Equations*	*3*	*0*
MTH3201	*Linear Algebra*	*3*	*0*
MTH3401	*Probability and Statistics I*	*3*	*0*
QLU2203	*Volunteerism development*	*0*	*2*
SLP2204	*Ethnic Relations*	*2*	*0*
XXXxxx	*Open Elective*		
	TOTAL		

2ND YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE3803	*Curriculum Development*	*3*	*0*
FCE3102	*Philosophy of Education*	*3*	*0*
FCE3804	*Early School Experience*	*0*	*1*
MGM3180	*Basic Entrepreneurship*	*2*	*1*
MTH3404	*Linear Model*	*3*	*0*
MTH3405	*Application of Selected Statistical PacLage*	*2*	*1*
*PHY3103**	*Physics I*	*3*	*1*
	TOTAL	***17***	***3***

3RD YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE3001	*Co-curricular Management*	*2*	*1*
FCE3101	*Ethics and Teacher Professionalism*	*2*	*0*
MTH3407	*Intermediate Probability*	*3*	*0*
MTH4959A	*Bachelor Dissertation*	*0*	*3*
STE4480	*Mathematics Teaching Method*	*2*	*1*
*PHY3105**	*Modern Physics*	*3*	*0*
	TOTAL	***11***	***6***

4TH YEAR

CODE	*COURSE NAME*	*L*	*L/T*
FCE4809	*Teaching Practice in Major Field*	*0*	*4*
FCE4810	*Teaching Practice for Second Option*	*0*	*4*
	TOTAL	***0***	***8***

COURSE SYNOPSIS

Department of Biology

BGY3000 Principle Biology 4(3+1)

Prerequisite : None

This course covers the cell theory and cell organisation in regulating homeostasis as basis of all physiology processes. Concept of genetic heredity and ecological interaction in organisms survival are also discussed

BGY3002 Cell and Molecular Biology 3(2+1)

Prerequisite : None

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 emphasized.

BGY3003 Developmental Biology 3(2+1)

Prerequisite : None

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

BGY3004 Evolutionary Biology 2(2+0)

Prerequisite : None

This course aims to provide a broad overview to the theory of modern evolution and to explain the formation of biodiversity patterns from the evolutionary perspective. Interactions with other disciplines such as biosystematics, ecology, physiology, ethology and genetic are discussed. Emphasis is given to understand the theory, conflict, reaction and relation of biological evolution in life.

BGY3100 Biology of Microorganisms 3(2+1)

Prerequisite : None

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.

BGY3103 Plant Diversity 4(3+1)

Prerequisite : None

This course covers a modern classification of Plant Kingdom with emphasis on the diversity found within the major phyla. This includes morphological, reproductive, distribution and other aspects of diversity. The evolution of vascular plants are discussed in terms of their adaptation towards terrestrial environment and increasing perfection which culminates in the dominance of the flowering plants today.

BGY3104 Animal Diversity 4(3+1)

Prerequisite : None

This course covers the diversity and phylogenetic survey related to the classification of animals. Characteristics of the main phylum, classses and families, morphology, habitat and distribution are explained. Emphasis is given to the identification and classification of local aquatic and terrestrial invertebrates and vertebrates which have economic importance and are food sources, including issues pertaining to conservation are discussed. Collection, sampling and preservation techniques as well as the function of the museums in modern biosystematics are explained.

BGY3201 Plant Structure and Function 3(2+1)

Prerequisite : None

This course covers the diversity of the morphology and anatomy, 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 Animal Structure and Function 3(2+1)

Prerequisite : None

This course comprises histology, anatomy and functions of various animal cells, tissues, organs and systems. Analysis on human histological slides, dissection on vertebrate specimens and identification on the external and internal organ structures are carried out. Adaptation of animal systems toward their environment is also discussed.

BGY3204 Plant Structure and Physiology 4(3+1)

Prerequisite : BGY3002

This course covers the diversity of the morphology and anatomy, primary and secondary growth of the root and stem, and adaptation of plant organs with physiology processes. Development of pollen and embryo sac, fertilization, formation of fruit and seed, as well as dispersal are also discussed. The concept of energy and its relationship with diffusion, osmosis and absorption in the plant system are described. Plant metabolisms such as translocation of water and dissolved mineral, transpiration, gaseous exchange, photosynthesis, photoassimilates, and respiration and their integration are also explained

BGY3301 Plant Physiology 4(3+1)

Prerequisite : BGY3201

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 Animal Physiology 4(3+1)

Prerequisite : BGY3202

The course comprises concept of homeostasis as a basis to all physiological phenomena involving cells, tissues, major organs and systems of the human body. Intracellular communication system characterizes molecular and cellular physiology. Nervous and hormone systems studied as intercellular communication mechanisms. Effector system includes muscle contraction. Integrated physiological mechanisms encompass systems of sensory, digestive and excretion, circulatory, respiratory, body fluid regulation, immune and reproduction. Also includes introduction to comparative physiology of vertebrate and invertebrate. The practicals investigate functions of body systems such as glucose homeostasis, blood pressure regulation, pulmonary function and diuresis.

BGY3304 Animal Structure and Physiology 4(3+1)

Prerequisite : BGY3002

This course consists of the conceptual physiological framework and the study of function, anatomy and histology at every level of animal/human organization (cell, tissue, organ and system). Physiological, morphological and structural adaptations of certain animal species towards their environment are also emphasized

BGY3401 Ecology 4(3+1)

Prerequisite : None

This course covers the major components of the environment including population, communities and ecosystem which are analyzed as dynamic entities. Theoretical and functional aspects are analyzed qualitatively and quantitatively. Exploitation of ecosystems, sources and effects of pollution, monitoring and conservation methods are discussed

BGY3501 Genetics 4(3+1)

Prerequisite : BGY3002

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 emphasized. The roles of genetics in medicine, biodiversity and bioresources conservation are discussed.

BGY3701 Biostatistics 3(2+1)

Prerequisite : None

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

BGY4001 Evolution and Behavioural Ecology 3(2+1)

Prerequisite : BGY3104 and BGY3401

This course covers the concepts of evolution, ecology and animal behaviour and their relationship with the environment. Darwin's Theory of Evolution, evolution of group living and the consequences on animal reproductive behaviour, parental care, social behaviour, altruistic behaviour, genetic and personality are discussed. Aspects of competition for resources, mating system, communication mode and social organisation of group living animals are also emphasized.

BGY4101 Mycology 4(3+1)

Prerequisite : BGY3100

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 Plant Chemotaxonomy 3(2+1)

Prerequisite : BGY3103 and BGY3201

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

BGY4103 Vermin Biology and Application 3(2+1)

Prerequisite : BGY3104

This course covers morphology, anatomy, habitat and diversity of local earthworm species. Sampling techniques, identification and classification of earthworms are introduced. The importance of earthworms in ecosystem and their commercial aspects are also discussed.

BGY4105 Phycology 3(2+1)

Prerequisite : BGY3100

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 Biology of Commercial Aquatic Organisms 4(3+1)

Prerequisite : BGY3104

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, reproductive strategy, adaptation and osmoregulation are emphasised. Genetic diversity, evolutionary history, phylogenetic and biogeography of the selected commercially important aquatic organisms are explained

BGY4107 Biology and Propagation of Commercial Algae 4(3+1)

Prerequisite : None

This course encompasses an exposure to commercial micro and macro algae. The biological and physical requirements for propagation, product and the commercial potential from the algae are discussed. Propagation methods, problems encountered, harvesting and processing techniques are explained.

BGY4108 Parasitology and Entomology in Health 4(3+1)

Prerequisite : BGY3104

This course covers parasitic organisms that infect invertebrates and vertebrates. Systematics and biology of parasitic Protozoa, Platyhelminthes, Acanthocephala, Nematoda and Arthropoda are emphasised. Health problems of man and domesticated animals which are caused by these parasites including the problems of zoonosis, parasite-host relationship, immunity, epidemiology and parasite infection prevention programmes are discussed.

BGY4109 Biosystematics and Conservation of Seed Plants 4(3+1)

Prerequisite : BGY3103 and BGY3201

This course covers the importance and methods of classification of seed plants. The role of genetics in biosystematics, biogeography and conservation are discussed. Current status, threats, in situ and ex situ conservation of Malaysian flora are emphasized.

BGY4302 Environmental Physiology (Plant) 3(2+1)

Prerequisite : BGY3301

This course covers the physiology of plants' response to their environment. The effects of light on growth, carbon metabolism, mineral and water requirements, response and adaptation of plant to water and temperature stress, toxicity and interaction among organisms are discussed.

BGY4303 Endocrinology of Reproduction 3(2+1)

Prerequisite : None

This course emphasizes on endocrine system and regulation of growth hormones in vertebrates. Role of hormones, receptor-hormone complexes and hypothalamic-pituitary axis in vertebrate reproductive system are discussed. Interaction between environmental factors and endocrine disruptors in endocrine hormone regulation are also emphasized.

BGY4304 Developmental Neurotoxicology 3(2+1)

Prerequisite : None

Developmental neurotoxicology encompasses various disciplines such as physiology, genetics, anatomy, toxicology and ecology. The main focus is to understand the impact of neurotoxicity on the development of embryonic and fetal nervous system. Diseases associated with the nervous system development and the role of environmental factors in the etiology of these diseases are discussed. Guidelines for chemicals in accordance with the existing risk assessment techniques, such as the OECD, REACH, US EPA are emphasized.

BGY4305 Principles and Methods of Epidemiology 3(2+1)

Prerequisite : None

This course covers basic concepts, principles and methods of epidemiology. The general approach of this course is both theoretical and quantitative, focusing on the methods in conducting research investigating the etiology of the disease. Emphasis is placed on basic epidemiological study designs, sampling, sample size determination, bias in selection, data collection techniques, secondary data sources and an introduction to mathematical models in epidemiology.

BGY4401 Tropical Forest Ecology 4(3+1)

Prerequisite : BGY3103 and BGY3401

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.

BGY4402 Wildlife Ecology 4(3+1)

Prerequisite : BGY3104 and BGY3401

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

BGY4403 Ecotoxicology 4(3+1)

Prerequisite : BGY3401

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 soils and sediments towards toxicants, monitoring and control of toxicants and aspects of standard and environmental protection are discussed.

BGY4404 Limnology and Oceanography 4(3+1)

Prerequisite : BGY3401

This course encompasses the origin of water bodies, morphometric features, water balance, hydrological cycle, differences in marine, brackish and freshwater, lotic and lenthic, 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.

BGY4405 Bacteriology in Environment 3(2+1)

Prerequisite : BGY3100

This course covers concepts, knowledge and application on bacteria related to mankind and environment. Isolation technique, infection prevention, toxin management and their applications in environment are introduced. Relationship between bacterial activities towards the useage and threat on environment are also discussed

BGY4406 Biology and Ecology of Seagrasses 4(3+1)

Prerequisite : None

This course covers the morphology, 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 various habitats and adaptive characteristics to marine environment, growth, productivity and primary factors controlling them are discussed

BGY4408 Applied Limnology 4(3+1)

Prerequisite : BGY3401

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.

BGY4409 Aquatic Ecosystem Management and Conservation 4(3+1)

Prerequisite : BGY3401

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.

BGY4501 Genetic Polymorphisms 4(3+1)

Prerequisite : BGY3501

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 toward medicine are discussed.

BGY4502 Genetics and Breeding of Aquatic Organisms 4(3+1)

Prerequisite : BGY3501

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 Comparative Reproductive Biology 4(3+1)

Prerequisite : BGY3104

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

BGY4504 Population Genetics 4(3+1)

Prerequisite : BGY3501

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 Quantitative Genetics 4(3+1)

Prerequisite : BGY3501

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 Separation and Purification Techniques in Protein Analysis 3(2+1)

Prerequisite : BGY3002

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

BGY4902 Research Methodology and Fieldwork in Biology 3(1+2)

Prerequisite : BGY3002

This course includes basic principles and good practices in experimental design and conducting experiment, data collection, statistical analysis, the use updated library information resources and scientific writing. Basic sampling techniques used in biological and ecological studies are introduced. Fieldwork involving selected ecosystems is conducted

BGY4903 Industrial Training 8 (0+8)

Prerequisite : BGY4959

This course covers industrial training for a period of 16 weeks at government/private sectors to apply the knowledge acquired in the programme of study.

BGY4959 Bachelor Dissertation 6 (0+6)

Prerequisite : BGY4902

This course covers the preparation of proposal, implementation and scientific writing of research project. Scientific approach to generate data systematically through appropriate design, data collection and analysis are emphasized.

Department of Physics

FSA4001 Quality Management System in Science 3(3+0)

Prerequisite : None

This course covers the quality management systems in organisation and industry. The standard ISO 9001, ISO 14001, ISO/IEC 17025 and OHSAS 18001 will be discussed and applied.

FSA4002 Inovation and Technology Management for Scientist 3(3+0)

Prerequisite : None

This course aims to equip students with understanding of the technological innovation processes. Students are exposed to the importance of technological innovation, policies and potential for economic growth.

PHY3000 Principles of Physics 4(3+1)

Prerequisite : None

This course introduces the basic principles of physics covering mechanics and dynamics, fluid, heat, light, waves, electricity, magnetism, electronic and radioactivity. Discussion is done qualitatively and quantitatively. Application of the basic principles of physics to society is also emphasized

PHY3103 Physics I 4(3+1)

Prerequisite : None

This course covers the motion of particles, and rigid bodies in one, two and three dimensions based on Newton's Law. Topics on vibration, wave mechanics and laws of thermodynamics and their application in thermal physics are also discussed.

PHY3104 Physics II 4(3+1)

Prerequisite : None

This course covers general concepts of electricity and magnetism. Topics include electric charges and fields, electric potential, magnetic fields, and electromagnetic waves. Huygen's principle, geometrical optics, and topics in physical optics including superposition of waves, diffraction and interference are also discussed.

PHY3105 Modern Physics 3(3+0)

Prerequisite : PHY3103 and PHY3104

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 also discussed.

PHY3201 Solid State Physics 3(3+0)

Prerequisite : PHY3103 and PHY3104

This course covers crystal structure and crystal binding forces. Effect of lattice vibration and free electron model on thermal, acoustic and optical modes in metals are discussed. Energy band model is employed to distinguish semiconductor, insulator and metals. Types of defects in metals are also discussed.

PHY3208 Magnetism and Magnetic Materials 3(3+0)

Prerequisite : PHY3201

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.

PHY3209 Thermodynamics 3(3+0)

Prerequisite : PHY3103

The course covers the concept of thermal physics and thermodynamics, including laws of thermodynamics, thermodynamic systems, kinetic theory of gases, thermodynamic potential, Maxwell relations and phase changes. The basics of heat transfer mechanisms such as heat conduction, convection and radiation.

PHY3303 Sensors and Transducers 4(3+1)

Prerequisite : PHY3306

This course covers 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 sensors, reactance sensors, electromagnetic sensors and self-generator sensors. Recent developments in sensor fields such as digital sensors, optical fiber sensors, sensors based on semiconductor devices and ultra-sonic sensors are also discussed. The final part deals with the applications of sensors in automated production and process control.

PHY3304 Principles of Measurement Systems 4(3+1)

Prerequisite : PHY3103 and PHY3104

This course covers basic elements in measurement system which is sensor, conditioning element, processing element and display. General aspects of measurement system such as static and dynamic characteristics that individual elements may possess in addition to the effects of noise and interference on system performance are discussed. A number of specialised measurement systems in the industry and research laboratory are also deliberated.

PHY3306 Electronics 4(3+1)

Prerequisite : None

This course covers the analysis of electronic circuits having components such as resistor, capacitor and inductor using Kirchhoff, Northern and Thevenin law. The characteristics and applications of electronic devices such as diode, transistor and operational amplifier are described. Basic digital technical concept, logic combination dan sequence, flip-flop as well as counter and analogue to digital conversion are also discussed.

PHY3401 Electromagnetism 3(3+0)

Prerequisite : PHY3103 and PHY3104

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 also discussed.

PHY3601 Quantum Mechanics 3(3+0)

Prerequisite : PHY3105

This course covers introduction to quantum mechanics, including wave function, uncertainty principle, application of Schrödinger equation to simple systems mostly in one dimension such as harmonic oscillators. The operator formalism is also emphasized. This includes the operator, eigenfunctions and eigenvalues of angular momentum and their matrix representations. Operator formalism and solutions to Schrödinger equation are used to describe angular momentum and hydrogen atom.

PHY3602 Statistical Mechanics 3(3+0)

Prerequisite : None

This course covers the characteristic features of macroscopic and microscopic, probability concepts, ensemble, 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 also discussed.

PHY3603 Classical Mechanics 3(3+0)

Prerequisite : PHY3103 and PHY3104

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 are also discussed.

PHY3604 Mathematical Methods in Physics 3(3+0)

Prerequisite : PHY3103 and PHY3104

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's function are also discussed.

PHY4201 Advanced Solid State Physics 3(3+0)

Prerequisite : PHY3201

This course covers the consequences of a periodic lattice structure on lattice vibrations and for the spectrum of electronic energy states. The course also highlights the role of crystal defects and intrinsic polarisation. These aspects underlie the properties and interactions involving crystal entities and external stimuli in metallic, semiconducting, insulating, magnetic and superconducting systems.

PHY4202 Semiconductor Devices 3(3+0)

Prerequisite : PHY3201

This course covers an integrated approach to the subject of semiconductor devices consisting of three primary fields: solid state physics, quantum theory and electronics. Conduction mechanisms, characteristics, operation and application of semiconductor devices are discussed. Semiconductor lasers and the effect of laser radiation on semiconductors are emphasized.

PHY4203 Materials Science 3(3+0)

Prerequisite : PHY3103 and PHY3104

This course covers the basic concepts on synthesis/fabrication, characterisation and potential applications of advanced materials. These include nano materials, composites, bio-materials, ceramics, photonics, polymers, materials for energy sustanainability and smart materials.

PHY4204 Analytical Methods of Structures and Microstructures 4(3+1)

Prerequisite : PHY3201

This course covers the analytical methods of structure and microstructure of crystals. The methods used cover x-ray diffraction, optical diffraction and electron microscopy.

PHY4205 Ceramics and Polymers 4(3+1)

Prerequisite : PHY3201

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

PHY4206 Metals and Alloys 4(3+1)

Prerequisite : PHY3201

This course covers the classification of types of metals, ferrous and nonferrous alloys. Emphasis is given to the study of phase diagrams of binary and ternary systems, crystallization and microstructures, the study of Fe-C phase diagram and interphases in material, effect of heat treatment and alloying. Effect of corrosion and its control are also discussed.

PHY4207 Materials Processing Technology 3(3+0)

Prerequisite : PHY3201

This course covers the characterization of material's properties, methods and techniques of processing and shaping 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.

PHY4208 Superconductor 3(3+0)

Prerequisite : PHY3201

The course covers the basic concept of superconductivity. Quantum mechanical approach and the atomic picture are used to explain the phenomenon and behaviour of superconductor materials. Superconducting state, Meissner effect and Josephson effect are also discussed. Techniques of measurements for superconducting properties are discussed. The applications of superconducting materials in devices and new advances are highlighted.

PHY4209 Advanced Materials 3(3+0)

Prasyarat : PHY3201

This course covers the basic concepts on synthesis/fabrication, characterisation and potential applications of advanced materials. These include nano materials, composites, bio-materials, ceramics, photonics, polymers, materials for energy sustanainability and smart materials.

PHY4210 Semiconductor Technology 3(3+0)

Prerequisite : PHY4202

The course covers the manufacturing practices used in silicon integrated circuit fabrication. Physical models are developed to explain basic fabrication steps of semiconductor devices. Students are also exposed to discrete and integrated circuit device design and VLSI processing technologies.

PHY4301 Microprocessors and microcomputers 3(3+0)

Prerequisite : PHY3306

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

PHY4302 Design of Electronic Equipment 4(3+1)

Prerequisite : PHY3306

This course covers various activities of electronic designs which include design planning, drawing, experimenting, prototyping, testing, troubleshooting and final documentation. Student will be exposed to design aspect in a project and produced simple electronic circuit based on student creativity. This subject also covers safety and electromagnetic compatibility issues.

PHY4303 Computer Interfacing and Control 4(3+1)

Prerequisite : PHY3306

This course covers the basic of data acquisition (DAQ) concepts and techniques for sampling electrical or physical phenomenon signals such as voltage, current, temperature, pressure and sound with a computer. A DAQ system consists of sensor, DAQ hardware and computer with programmable software. Students will be exposed to the state of the art methods of processing power, productivity, display and connectivity capabilities of industry standard computer for flexible and cost effective measurement solution.

PHY4304 Microcontroller System and Design 4(3+1)

Prerequisite : PHY3303

This course covers the fundamentals of the hardware, software and integration of a microcontroller based system. Various aspect of hardware design, such as interfacing of memory and different types of I/O device, are covered in details. Both assembly and graphical programming are used to perform software development, hardware development and hardware-software integration.

PHY4305 Advanced Instrumentation 3(3+0)

Prerequisite : PHY3304

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 ionising and non-ionasing radiations. Special instrument related to non-destructive techniques and thermal analysis will be discussed.

PHY4401 Applied Electromagnetism 3(3+0)

Prerequisite : PHY3401

This course covers the application of Maxwell's equations and propagation of plane waves. Transmission lines, waveguides, electromagnetic principles in photonics and antennas are discussed. Applications of electromagnetic in current tehnologies are also discussed.

PHY4403 Geometrical and Wave Optics 3(3+0)

Prerequisite : PHY3104

This course introduces the principles and theory of light as a geometric ray and wave nature of light. The geometrical optics discusses the light phenomena such as reflection, refraction and aberration. The wave optics covers wave equation, electromagnetic waves, interaction of light waves, propagation of light, interference, diffraction and polarization.

PHY4404 Optoelectronics and Photonics 3(3+0)

Prerequisite : PHY4403

This course covers fundamental concepts in optoelectronics and photonics. It covers general topics in optoelectronics and photonics including wave dielectric waveguides, light source and emission, light devices and light detectors.

PHY4502 Radiation Physics and Radiobiology 3(3+0)

Prerequisite: PHY3105

This course covers radiation sources, their properties and interaction with matter. Radiation detectors, biological effects of irradiation and radiation protection are discussed. Methods of protection monitoring and applications of ionizing radiation are emphasised.

PHY4503 Special Relativity & Classical Field Theory 3(3+0)

Prerequisite : PHY3103 and PHY3104

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

PHY4504 Nuclear Physics 3(3+0)

Prerequisite : PHY3105

This course covers basic nuclear structure, nuclear models and their properties. Properties of nuclear instability will be studied with emphasis on decay processes such as the alpha, beta, gamma, nuclear fission and nuclear reaction. The principle of nuclear instruments and installations of radiation detectors, accelerators, nuclear reactor and other nuclear experimental techniques are given. The students are exposed to various nuclear applications including neutron diffraction technique, non-destructive radiation technique and tracer technique. The basic principle of elementary particle physics involving electromagnetic interaction, weak interaction and strong interaction are briefly explained.

PHY4601 Mathematical Physics 3(3+0)

Prerequisite: PHY3604

This course covers mathematical techniques including calculus of variations, tensor analysis, special functions, series solutions of differential equations, partial differential equations and functions of a complex variable. Application of mathematics in physics problems are also discussed.

PHY4602 Computational Physics 4 (3+1)

Prerequisite : MTH3100

This course covers simple numerical methods including numerical integration, numerical differentiation, matrix operation and the solution of differential equations. The application of such techniques to classical, quantum and statistical physics as well as analysis of experimental data are also discussed.

PHY4603 Advanced Quantum Mechanics 3(3+0)

Prerequisite: PHY3601

This course covers the advanced aspects of quantum mechanics. Emphasize will be given on the use of quantum mechanical methods to more realistic and detailed aspects like spin and addition of angular momenta, identical particles, three dimensional scattering theory and approximation methods for systems with more complex potentials. A brief introduction of relativistic quantum mechanics is given.

PHY4902 Special Topics 3(3+0)

Prerequisite: PHY3105

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

PHY4903 Industrial Training 8(0+8)

Prerequisite : PHY4959

This course covers industrial training for a period of 16 weeks at government/private sectors to apply the knowledge acquired in the programme of study.

PHY4995 Physics Advanced Practicals 3(0+3)

Prerequisite : PHY3105

This course covers advanced physics experiments with aims to train students to handle scientific instruments and acquire techniques in experimental science. Fields of study include Solid State Physics, Modern Physics, Optics, Thermal Physics and Electromagnetism.

PHY4959 Bachelor Dissertation 6(0+6)

Prerequisite : None

This course aims to equip student with skills and knowledge necessary to solve a physical science project of appropriate complexity in a fixed period. The student will integrate their study courses and expand their knowledge through self-directed research. It requires the student to review the literature, design a research project, use of appropriate reseach techniques, data collection and analyses, interpretation of results, and make a discussion and conclusion of scientific study.

Department of Chemistry

CHM3000 Principle of Chemistry 4(3+1)

Prerequisite : None

This course covers basic concept and applications of chemistry. This includes states of matter, thermodynnamics, electrochemistry, nuclear chemistry, Industries based on chemicals, bonding and structure of organic compounds, aliphatic and aromatic hydrocarbons, alcohol, fats and oils industry and polymer

CHM3010 Physical and Inorganic Chemistry 4(3+1)

Prerequisite : None

This course covers basic aspects of physical and inorganic chemistry. This includes 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

CHM3011 Basic Inorganic Chemistry 3(2+1)

Prerequisite: CHM2000

This course discusses several basic aspects of inorganic chemistry which covers periodic table and its properties, main group elements, transition elements, molecular structure, bonding, intermolecular interactions and nuclear chemistry

CHM3100 Basic Physical Chemistry 4(3+1)

Prerequisite : None

This course covers the concept of physical chemistry and application of quantum theory in atomic energy and orbital shapes. The application of quantum theory in thermodynamic and kinetics are also discussed

CHM3101 Physical Chemistry 4(3+1)

Prerequisite : CHM3100 or CHM3010

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 Polymer Chemistry 3(2+1)

Prerequisite : CHM3100 or CHM3010

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 Chemical Kinetics 3(2+1)

Prerequisite: CHM3101

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

CHM3104 Chemical Thermodynamics 3 (2+1)

Prerequisite : CHM3101

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

CHM3201 Organic Chemistry I 4(3+1)

Prerequisite : CHM2000

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.

CHM3202 Organic Chemistry II 4(3+1)

Prerequisite : CHM3201

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 Organic Chemistry III 3(2+1)

Prerequisite : CHM3201

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 Organic Chemistry IV 4(3+1)

Prerequisite : CHM3203 and CHM3402

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

CHM3301 Inorganic Chemistry I 3(2+1)

Prerequisite : CHM3300 or CHM3011

This course covers basic concepts in inorganic chemistry, symmetry, point group, crystal chemistry, crystal defects, solid solutions, oxides, silicates and hydrides.

CHM3302 Inorganic Chemistry II 3(2+1)

Prerequisite : CHM3301

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 Inorganic Chemistry III 3(2+1)

Prasyarat : CHM3301

This course covers transition metals, rare earth metals and organometallic compounds as well as their uses in industry, especially in homogeneous and heterogeneous catalysis.

CHM3401 Analytical Chemistry 3(2+1)

Prerequisite : CHM3100 or CHM3010

This course discusses the basic methods in analytical chemistry such as titrimetry, gravimetry, chromatography, electrochemistry, thermal analysis, solvent extraction, radiochemical methods and flow injection analysis.

CHM3402 Chemical Spectroscopy 4(3+1)

Prerequisite : CHM3100 and CHM3201

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. Interpretation of spectroscopic data is emphasised.

CHM3500 Chemical Technology Principles 4(4+0)

Prerequisite : CHM3101

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

CHM3501 Industrial Chemistry I 3(3+0)

Prerequisite : CHM3301

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 Industrial Chemistry II 3(3+0)

Prerequisite: CHM3202

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, as well as the synthesis and formulation of herbicides, fungicides and insecticides.

CHM3503 Industrial Polymer Chemistry 3(3+0)

Prerequisite : CHM3102

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 Oleochemistry 3(2+1)

Prerequisite : CHM3202

This course covers various aspects of oils and fats, including oleochemical derivatives. The use of latest technology including microemulsion and biotechnology are also discussed. Case studies on producing oils and fats will be given attention.

CHM3601 Petroleum Chemistry 3(3+0)

Prerequisite: CHM3202

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

CHM3602 Petroleum Refining Processes 3(3+0)

Prasyarat : CHM3601

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 Petrochemicals 3(3+0)

Prerequisite : CHM3602

This course deals with processes for production of chemicals intermediate including conditions and flow-chart to produce either chemicals or finished 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 are discussed.

CHM3604 Oil Spill Control 3 (3+0)

Prerequisite : CHM3601

This course covers aspects in controlling oil spills in the petroleum industry. It includes discussion on the spill characteristics, chemical-physical and biological treatments, economics, and international regulation on oil spills. A case study in oil spill control will be carried out.

CHM3701 Computational Chemistry 4(3+1)

Prerequisite: CHM3101

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 intelligence and visualization.

CHM3702 Protein Chemistry 3(3+0)

Prerequisite : CHM3202 and CHM3402

This course covers chemistry aspects of protein, peptide and nucleotide. It includes an introduction to amino acids and nucleotides, structure of protein and peptide, protein and peptide synthesis, biophysical characterization, protein thermodynamics, enzymatic synthesis, protein-based drug and special topics in protein engineering.

CHM4001 Industrial Chemistry 3(3+0)

Prerequisite: CHM3201

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 polymers, soap, detergents, paints, pigments and cement are also discussed.

CHM4101 Solid State Chemistry 3 (3+0)

Prerequisite : CHM3101 and CHM3301

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

CHM4102 Electrochemistry 3(3+0)

Prerequisite : CHM3101 and CHM3401

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

CHM4201 Special Topics in Organic Chemistry 3(3+0)

Prerequisite : CHM3202

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

CHM4301 Advanced Inorganic Chemistry 3(2+1)

Prerequisite : CHM3302

This course covers important concepts in inorganic chemistry including bonding, reactions and catalysis of organometallic compounds and the different types of organometallic cluster compounds. Includes supramolecular architecture, self-assembly and their relationship to host-guest chemistry. Discussion on selected topics is designed to expose students to new materials and recent developments in inorganic chemistry

CHM4701 Catalysis 3(3+0)

Prerequisite : CHM3101

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

CHM4903 Industrial Training 8(0+8)

Prerequisite: CHM4959

This course covers an industrial training for a period of 16 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.

CHM4959 Bachelor Dissertation 6(0+6)

Prerequisite : None

This course covers the preparation of proposal, implementation and scientific writing of research project. Scientific approach to generate data systematically through appropriate design, data collection and analysis are emphasized

Department of Mathematics

MTH3100 Calculus 3(3+0)

Prerequisite : None

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 emphasized.

MTH3101 Advanced Calculus 3(3+0)

Prerequisite : MTH3100

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 Differential Equations 3(3+0)

Prerequisite : MTH3100 and MTH3200

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 its applications to initial value and boundary value problems are discussed.

MTH3103 Vector Analysis 3(3+0)

Prerequisite : MTH3100

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 Mathematical Methods 3(3+0)

Prerequisite : MTH3102 and MTH3201

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 methods are discussed.

MTH3200 Algebra 3(3+0)

Prerequisite : None

This course covers mantic and set theories, relations, functions, 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 Linear Algebra 3(3+0)

Prerequisite : MTH3100 and MTH3200

This course covers vector spaces, bases for vector space, linear transformation, matrix representation, rank and nullity, eigenvalues, eigenvectors and eigenspace.

MTH3202 Introduction to Modern Algebra 3(3+0)

Prerequisite : MTH3201

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

MTH3301 Real Analysis 3(3+0)

Prerequisite : MTH3101

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

MTH3302 Complex Analysis 3(3+0)

Prerequisite: MTH3101

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 are also discussed.

MTH3401 Probability and Statistics I 3(3+0)

Prerequisite : MTH3100

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

MTH3402 Probability and Statistics II 3(3+0)

Prerequisite : MTH3401

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

MTH3403 Experimental Design 3(3+0)

Prerequisite : MTH3401

This course covers basic concepts in statistics, basic principles in design of experiments, their aims and implementations. Several important designs and their appropriate analyses are discussed. The designs considered are completely randomized design, randomized complete block design, Latin square design, balanced incomplete block design, two and three factors factorial design and 2^k factorial design for k=2 and k=3.

MTH3404 Linear Model 3(3+0)

Prerequisite: MTH3402

This course covers types and algebra of matrices, eigen values and eigen vectors, the multivariate normal distribution, as well as the mean and variance of distribution of quadratic forms. Estimation and hypothesis testing on parameters of full rank and non full rank linear regression models, and correlation analysis using matrix approach are also discussed.

MTH3405 Applications of Selected Statistical Package 3(2+1)

Prerequisite : MTH3402

This course covers applications of selected statistical package for performing descriptive analysis, estimation and inference on data.

MTH3406 Statistical Quality Control 3(3+0)

Prerequisite : MTH3402

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

MTH3407 Intermediate Probability 3(3+0)

Prerequisite : MTH3402

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

MTH3408 Introduction to Bayesian Method 3(3+0)

Prerequisite: MTH3402

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 Computational Statistics 3(2+1)

Prerequisite : MTH3405

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

MTH3410 Statistical Modelling and Inference 3(3+0)

Prerequisite : MTH3402

This course introduces the concepts and tools required for statistical modeling and inference. Topics include statistical models, likelihood functions and inference parameters. This course also discusses regularity in a model, asymptotic theory and estimator issue.

MTH3411 Regression Analysis 3(3+0)

Prerequisite : MTH3402

This course covers simple and multiple linear regression model building. Topics discussed include parameter estimation, hypothesis testing, analysis of variance, confidence interval, correlation, residual analysis and prediction. Polynomial regression model with qualitative variable is also discussed.

MTH3500 Computer Programming in Mathematics 4(3+1)

Prerequisite : None

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 emphasized. Programme designing using flowcharts or pseudo-code and structured programming concept are discussed.

MTH3501 Numerical Analysis 3(3+0)

Prasyarat : MTH3500, MTH3102 dan MTH3201

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

MTH3602 Mathematical Programming 3(3+0)

Prerequisite : MTH3102 and MTH3201

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

MTH3701 Financial Mathematics 3(3+0)

Prasyarat : MTH3100

This course covers the theory and force of interest, various types of annuities, bonds, capital budgetting and depreciation. Stochastic approach is also discussed.

MTH3901 Research Processes in Mathematics and Statistics 3(1+2)

Prerequisite : MTH3500

This course covers research process and method and also information retrieval skills. 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 Theory of Ordinary Differential Equations 3(3+0)

Prerequisite : MTH3102 and MTH3301

This course covers pure quantitative theory, approximate quantitative theory and qualitative theory, theory of existence and uniqueness of solutions of ordinary differential equations and Sturm-Liouville theory. 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 are discussed by using Liapunov's direct method.

MTH4105 Theory of Integral Equations 3(3+0)

Prerequisite : MTH3102 and MTH3301

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 Partial Differential Equations 3(3+0)

Prerequisite : MTH3104 and MTH3301

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 Abstract Algebra 3(3+0)

Prerequisite : MTH3202

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. The course ends with introduction of elements of algebraic geometry.

MTH4202 Number Theory 3(3+0)

Prerequisite : MTH3101 and MTH3202

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

MTH4203 Graph Theory 3(3+0)

Prerequisite : MTH3202

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 Combinatorics 3(3+0)

Prerequisite : MTH3202

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 also discussed.

MTH4205 Mathematical Cryptography 3(3+0)

Prerequisite : MTH3202

This course covers the concepts of number theory, abstract algebra, finite fields, information theory, complexity theory and probability theory to understand the ideas regarding the discrete log problem, strength of an algorithm, information security, encryption, decryption, symmetric systems, asymmetric systems, digital signatures and cryptanalysis in cryptography. The mathematical cryptographic theory behind asymmetric, digital signature and symmetric cryptosystems are emphasized.

MTH4301 Topology 3(3+0)

Prerequisite : MTH3301

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 Functional Analysis 3(3+0)

Prerequisite : MTH3201 and MTH3301

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.

MTH4401 Sampling Techniques 3(3+0)

Prasyarat : MTH3403

This course covers the various sampling 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.

MTH4402 Special Topics In Statistic (3+0)

Prerequisite : MTH3405

Selected topics in statistics determined by the Department will be discussed in depth in the lecture.

MTH4403 Nonparametric Statistics (3+0)

Prerequisite : MTH3403 and MTH3404

This course covers nonparametric methods in which the normality assumption of the population from which the samples are drawn is not met. The course begins with a brief discussion on the nonparametric methods and comparing them with the parametric methods. This is followed by the discussion on order statistics and their distributions (joint and marginal), test for randomness, location and dispersion problems for independent and related samples, problem on the goodness of fit and measure of association. The course ends with discussion on simple linear regression.

MTH4404 Stochastic Processes 3(3+0)

Prerequisite: MTH3402 and MTH3102

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

MTH4405 Multivariate Analysis 3(3+0)

Prerequisite : MTH3405

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

MTH4406 Time Series 3(3+0)

Prerequisite: MTH3404

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 Interactive Computational Methods In Data Analysis 3(3+0)

Prerequisite : MTH3405

The course covers analyses and interpretations of output from selected statistical package. Transformations in statistical models, assumptions checking, residual analysis, outliers, statistical simulations and applications of variance as well as group case studies on related examples are discussed.

MTH4408 Introduction to Survival Analysis 3(3+0)

Prerequisite : MTH3405

This course introduces the concepts and tools required for the analysis of survival data. The topics include exploratory, parametric and semi-parametric techniques. This course also involves the usage of appropriate statistical package in the analysis.

MTH4501 Advanced Numerical Analysis 3(3+0)

Prerequisite: MTH3501

This course covers the techniques for solving differential equations numerically using one-step and multistep methods. Zero and absolute stability will be investigated. Numerical methods for solving partial differential equations are also discussed.

MTH4502 Approximation Theory 3(3+0)

Prerequisite : MTH3602

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 Optimal Control 3(3+0)

Prerequisite : MTH3104

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 Operations Research 3(3+0)

Prerequisite : MTH3602

This course covers analysis, technique and mathematical modeling in the field of operations research. Transportation problems, network models, inventory models, and queuing systems are discussed.

MTH4604 Optimization Techniques 3(3+0)

Prerequisite : MTH3401, MTH3201

This course covers an elementary theory on which the current optimization techniques are based. The detailed theoretical concepts and the actual application of optimization techniques are emphasized.

MTH4605 Control Theory 3(3+0)

Prerequisite : MTH3104 dan MTH3301

This course covers a new and current approaches on classical linear control theory, basic knowledge of analysis and automatic design, or closed loop of control systems.

MTH4606 Special Topics In Applied Mathematics 3(3+0)

Prerequisite: MTH3104

This course discusses the current topics in applied mathematics.

MTH4800 History of Mathematics (3+0)

Prerequisite : MTH3301

This 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 development in some important branches of mathematics including number theory, algebra, geometry and logic are discussed.

MTH4903 Industrial Training 8(0+8)

Prerequisite: MTH4959

This course covers industrial training for a period of 16 weeks at government/private sectors to apply the knowledge acquired in the programme of study.

MTH4959 Bachelor Dissertation 6(0+6)

Prerequisite : None

This course covers literature review, appropriate research methodology, data collection and analysis, interpretation of results, discussion and conclusion of scientific studies and presentation of research output.