Academic Programs Booklet

College of Science

2017

Prepared By: VP For Academic Programs and Graduate Studies Office

College of Science

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College of Science

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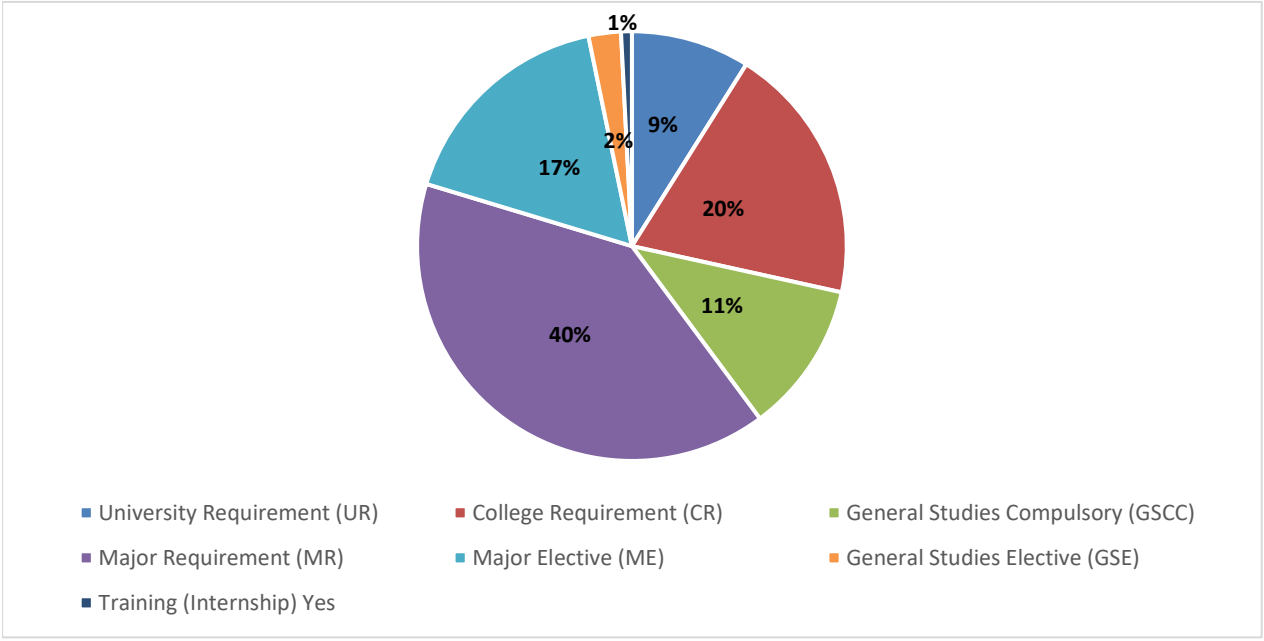
List of College Requirement Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		LEC	PRAC	CRD		
CHEMY 101	Geneal Chemistry I	3	3	4	CR	-----
BIOLS 102	General Biology I	3	3	4	CR	-----
PHYCS 101	General Physics I	3	3	4	CR	-----
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----
TCS 113	Computer Programming I	3	2	3	CR	-----
ENGL 125	English for Science I	3	0	3	CR	-----
NGL 126	English for Science II	3	0	3	CR	-----

Bachelor of Science in Biology (Single Track) 2017

Program Components



University Requirement (UR)	**11**
College Requirement (CR)	**24**
General Studies Compulsory (GSCC)	**14**
Major Requirement (MR)	**49**
Major Elective (ME)[1]	**21**
General Studies Elective (GSE)[2]	**9**
Training (Internship) **Yes**	**1**
Total Credit (CRD)	**129**

Teaching Language: English

[1] Student must select **seven** (3XX & 4XX) courses from Major Elective (ME) List.

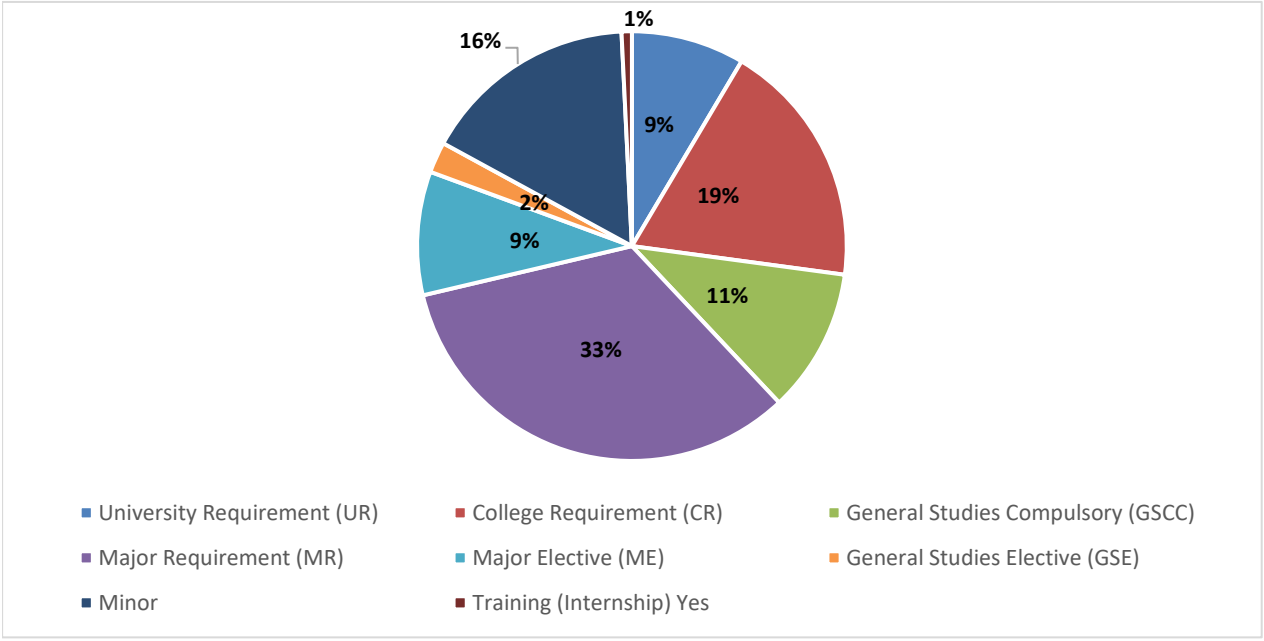
[2] Student must select **three** General Studies Electives, one of them must be from Humanities and Social Science.
Note:

- Free Elective Courses: any UOB course excluding: (1) courses offered for special students, (2) courses covered in the B.Sc. curriculum, (3) courses equivalent or lower than those already taken in the curriculum and should not be a science course prepared by College of Science for other colleges.

- HU/SS Courses - Humanities and Social Science Component: Any course from the following:
  Humanities: Fine Arts, History, American Studies, Classics, Communications, English, (Foreign Language) French, Music, Philosophy, Theatre, Literature (Arabic), Religion (comparative).
  Social Science: Anthropology, Economics, Education, Geography, History, Psychology, Sociology, Women's Studies, Political Science.

Bachelor of Science in Biology (Major Biology) 2017

Program Components



University Requirement (UR)	**11**
College Requirement (CR)	**24**
General Studies Compulsory (GSCC)	**14**
Major Requirement (MR)	**43**
Major Elective (ME)[1]	**12**
General Studies Elective (GSE)[2]	**3**
Minor[3]	**21**
Training (Internship) Yes	**1**
Total Credit (CRD)	**129**

Teaching Language: English

[1] Student should select **four** major elective courses from Major Elective List.

[2] Student should select **one** Elective course from Humanities and Social Science.

Note:

- HU/SS Courses - Humanities and Social Science Component: Any course from the following:
  Humanities: Fine Arts, History, American Studies, Classics, Communications, Foreign Language, Music, Philosophy, Theatre, Literature (Arabic), and Religion (comparative).
  Social Science: Anthropology, Economics, Education, Geography, History, Psychology, Sociology, Women's Studies, and Political Science.

[3] Student should take 7 courses as Minor track from one of the following specializations: Astronomy, Chemistry, Computer Science, Mathematics, physics, or Statistics according to the requirements of the department offering the minor.

Important Note: Overlapping Courses

If any of the listed courses in the minor requirements tables below is covered as part of the major degree requirements, then the student must replace them with an equal number of courses from the minor field, which are at the same level or higher. The total number of minor courses must be seven for all fields, with a minimum of 21 credit hours.

Detailed Study Plan (Single Track) 2017

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110	Arabic Language Skills	3	0	3	UR	-----	No
BIOLS 102	General Biology I	3	3	4	CR	-----	Yes
CHEMY 101	General Chemistry I	3	3	4	CR	-----	No
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----	No
ENGL 125	English for Science I (SCI)	3	0	3	CR	-----	No

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 103	General Biology II	3	3	4	MR	BIOLS 102	Yes
ITCS 113	Computer Programming I	3	2	3	CR	-----	No
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	-----	No
PHYCS 101	General Physics I	3	3	4	CR	-----	No
ISLM 101	Islamic Culture	3	0	3	UR	-----	No

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 232	Invertebrate Zoology I	2	3	3	MR	BIOLS 103	Yes
BIOLS 250	Microbiology	2	3	3	MR	BIOLS 103	Yes
CHEMY 102	General Chemistry II	3	3	4	MSR	CHEMY 101	No
ENGL 126	English for Science II	3	0	3	CR	ENGL 125	No
MATHS 122 or PHYCS 102	Calculus and Analytic Geometry II or General Physics II	4 3	0 3	4 4	MSR	MATHS 121 PHYCS 101	No

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 222	Plant Morphology	2	3	3	MR	BIOLS 103	Yes
BIOLS 234	Chordate Zoology	2	3	3	MR	BIOLS 103	Yes
CHEMY 223	Organic Chemistry for Biology	2	3	3	MSR	CHEMY 102	No
STAT 272	Introduction to Biostatistics	2	3	3	MSR	------	No
GSE XXX	Humanities / Social Science	X	X	3	GSE	------	No

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 300	Cell Biology	2	3	3	MR	BIOLS 102	Yes
BIOLS 360	Principles of Genetics	2	3	3	MR	BIOLS 102	Yes
BIOLS 340	General Ecology	2	3	3	MR	BIOLS 103	Yes
HRLC 107	Human Rights	2	0	2	UR	-----	No
BIOLS 3XX	Major Elective 1	X	X	3	ME	As per ME list	Yes
BIOLS 3XX	Major Elective 2	X	X	3	ME	As per ME list	Yes

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 315	Biochemistry	2	3	3	MR	BIOLS 102 & CHEMY 223	Yes
BIOLS 320	Plant Physiology	2	3	3	MR	BIOLS 300	Yes
BIOLS 380	Marine Biology	2	3	3	MR	BIOLS 340	Yes
BIOLS 372	Human Physiology	2	3	3	MR	BIOLS 300	Yes
BIOLS 3/4XX	Major Elective 3	X	X	3	ME	As per ME list	Yes

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 398	Internship	0	0	1	MR-Training	Completion of 75 credits	No

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 404	Biotechnology	2	3	3	MR	BIOLS 250 & BIOLS 360	Yes
BIOLS 465	Gene Technology	2	3	3	MR	BIOLS 250 & BIOLS 360	Yes
BIOLS 3/4XX	Major Elective 4	X	X	3	ME	As per ME list	Yes
GSE XXX	Free Elective Course 1	X	X	3	GSE	-----	No
BIOLS 499	Senior Research Project	0	9	3	MR	Department Approval	Yes

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 451	Immunology	2	3	3	MR	BIOLS 250	Yes
BIOLS 4XX	Major Elective 5	2	3	3	ME	As per ME list	Yes
GSE XXX	Free Elective Course 2	X	X	3	GSE	-----	No
BIOLS 4XX	Major Elective 6	X	X	3	ME	As per ME list	Yes
BIOLS 4XX	Major Elective 7	X	X	3	ME	As per ME list	Yes

Detailed Study Plan (Major Biology) 2017

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110	Arabic Language Skills	3	0	3	UR	-----	No
BIOLS 102	General Biology I	3	3	4	CR	-----	Yes
CHEMY 101	General Chemistry I	3	3	4	CR	-----	No
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----	No
ENGL 125	English for Science I	3	0	3	CR	-----	No

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 103	General Biology II	3	3	4	MR	BIOLS 102	Yes
ITCS 113	Computer Programming I	3	2	3	CR	-----	No
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	-----	No
PHYCS 101	General Physics I	3	3	4	CR	-----	No
ISLM 101	Islamic Culture	3	0	3	UR	-----	No

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 232	Invertebrate Zoology I	2	3	3	MR	BIOLS 103	Yes
BIOLS 250	Microbiology	2	3	3	MR	BIOLS 103	Yes
CHEMY 102	General Chemistry II	3	3	4	MSR	CHEMY 101	No
ENGL 126	English for Science II	3	0	3	CR	ENGL 125	No
MATHS 122 or PHYCS 102*	Calculus and Analytic Geometry II or General Physics II	4 3	0 3	4 4	MSR	MATHS 121 PHYCS 101	No

***If the student wants to select Physics as Minor, then he/she must register PHYCS 102 here**

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 222	Plant Morphology	2	3	3	MR	BIOLS 103	Yes
BIOLS 234	Chordate Zoology	2	3	3	MR	BIOLS 103	Yes
CHEMY 223*	Organic Chemistry for Biological Sciences	2	3	3	MSR	CHEMY 102	No
STAT 272	Introduction to Biostatistics	2	3	3	MSR	------	No
GSE XXX	Humanities / Social Science	X	X	3	GSE	-----	No

***CHEMY 221 for Major Biology Minor Chemistry**

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 300	Cell Biology	2	3	3	MR	BIOLS 102	Yes
BIOLS 360	Principles of Genetics	2	3	3	MR	BIOLS 102	Yes
BIOLS 380	Marine Biology	2	3	3	MR	BIOLS 340	Yes
Minor	Course 1	X	X	3	Minor	As per Minor	No
BIOLS 3/4XX	Major Elective 1	X	X	3	ME	As per ME list	Yes
HRLC 107	Human Rights	2	0	2	UR	-----	No

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 315	Biochemistry	2	3	3	MR	BIOLS 102 & CHEMY 223	Yes
BIOLS 320	Plant Physiology	2	3	3	MR	BIOLS 300	Yes
BIOLS 340	General Ecology	2	3	3	MR	BIOLS 103	Yes
BIOLS 372	Human Physiology	2	3	3	MR	BIOLS 300	Yes
Minor	Course 2	X	X	3	Minor	As per Minor	No

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 398	Internship	0	0	1	MR-Training	Completion of 75 credits	No

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 404	Biotechnology	2	3	3	MR	BIOLS 250 & BIOLS 360	Yes
BIOLS 3/4XX	Major Elective 2	X	X	3	ME	As per ME list	Yes
Minor	Course 3	X	X	3	Minor	As per Minor	No
Minor	Course 4	X	X	3	Minor	As per Minor	No
Minor	Course 5	X	X	3	Minor	As per Minor	No

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 465	Gene Technology	2	3	3	MR	BIOLS 250 & BIOLS 360	Yes
BIOLS 3/4XX	Major Elective 3	X	X	3	ME	As per ME list	Yes
BIOLS 4XX	Major Elective 4	X	X	3	ME	As per ME list	Yes
Minor	Course 6	X	X	3	Minor	As per Minor	No
Minor	Course 7	X	X	3	Minor	As per Minor	No

Major Elective Courses List

Plant Science

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 321	Plant Anatomy	2	3	3	ME	BIOLS 103	Yes
BIOLS 322	Economic Botany	3	0	3	ME	BIOLS 222	Yes
BIOLS 324	Plant Taxonomy	2	3	3	ME	BIOLS 222	Yes
BIOLS 325	Phycology	2	3	3	ME	BIOLS 222	Yes
BIOLS 423	Plant Growth Hormones	2	3	3	ME	BIOLS 300 & BIOLS 320	Yes
BIOLS 424	Algal Ecology	2	3	3	ME	BIOLS 340	Yes
BIOLS 425	Terrestrial Plant Ecology	2	3	3	ME	BIOLS 340	Yes
BIOLS 426	Horticulture	2	3	3	ME	BIOLS 320	Yes
BIOLS 427	Stress Physiology	2	3	3	ME	BIOLS 320	Yes
BIOLS 428	Plant Biodiversity	2	3	3	ME	BIOLS 222 & BIOLS 340	Yes
BIOLS 457	Plant Pathology	2	3	3	ME	BIOLS 250	Yes
BIOLS 467	Plant Tissue Culture	2	3	3	ME	BIOLS 300	Yes

Applied Microbiology and Biotechnology

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 321	Plant Anatomy	2	3	3	ME	BIOLS 103	Yes
BIOLS 322	Economic Botany	3	0	3	ME	BIOLS 222	Yes
BIOLS 324	Plant Taxonomy	2	3	3	ME	BIOLS 222	Yes
BIOLS 325	Phycology	2	3	3	ME	BIOLS 222	Yes
BIOLS 423	Plant Growth Hormones	2	3	3	ME	BIOLS 300 & BIOLS 320	Yes
BIOLS 424	Algal Ecology	2	3	3	ME	BIOLS 340	Yes
BIOLS 425	Terrestrial Plant Ecology	2	3	3	ME	BIOLS 340	Yes
BIOLS 426	Horticulture	2	3	3	ME	BIOLS 320	Yes
BIOLS 427	Stress Physiology	2	3	3	ME	BIOLS 320	Yes
BIOLS 428	Plant Biodiversity	2	3	3	ME	BIOLS 222 & BIOLS 340	Yes
BIOLS 457	Plant Pathology	2	3	3	ME	BIOLS 250	Yes
BIOLS 467	Plant Tissue Culture	2	3	3	ME	BIOLS 300	Yes

Marine Biology

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 383	Oceanography	2	3	3	ME	BIOLS 380	Yes
BIOLS 385	Marine Pollution	2	3	3	ME	BIOLS 250 & BIOLS 340	Yes
BIOLS 429	Marine and Fresh water Botany	2	3	3	ME	BIOLS 222 & BIOLS 340	Yes
BIOLS 481	Fish and Fisheries	2	3	3	ME	BIOLS 234	Yes
BIOLS 482	Marine Ecology of the Arabian Gulf	2	3	3	ME	BIOLS 340	Yes

Molecular Biology and Genetic Engineering

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 460	Human Genetics	3	0	3	ME	BIOLS 360	Yes
BIOLS 461	Plasmid and Recombinant DNA	2	3	3	ME	BIOLS 250 & BIOLS 360	Yes
BIOLS 463	Theme course in Molecular Biology	3	0	3	ME	BIOLS 360 & BILOS 465	Yes
BIOLS 468	Animal Tissue Culture	2	3	3	ME	BIOLS 300	Yes
BIOLS 464	Molecular Biology of Oncogenes	3	0	3	ME	BIOLS 360 & BILOS 465	Yes
BIOLS 466	Molecular Mechanisms of Bacterial Pathogenesis	2	3	3	ME	BIOLS 250 & BIOLS 360	Yes

Human and Animal Physiology, Nutrition and Zoology

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 330	Parasitology	2	3	3	ME	BIOLS 232	Yes
BIOLS 333	Invertebrate Zoology II	2	3	3	ME	BIOLS 232	Yes
BIOLS 334	Comparative Chordate	2	3	3	ME	BIOLS 234	Yes
BIOLS 371	Principles of Nutrition	2	3	3	ME	BIOLS 102	Yes
BIOLS 402	Organic Evolution	3	0	3	ME	BIOLS 340 & BIOLS 360	Yes
BIOLS 432	Embryology	2	3	3	ME	BIOLS 234	Yes
BIOLS 438	Endocrinology	2	3	3	ME	BIOLS 372	Yes
BIOLS 474	Comparative Animal Physiology	2	3	3	ME	BIOLS 372	Yes
BIOLS 471	Nutrition through human life cycle	3	0	3	ME	BIOLS 371	Yes

Other Electives

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 353	Virology	2	3	3	ME	BIOLS 250 & BIOLS 360	Yes
BIOLS 454	Advanced Virology	2	3	3	ME	BIOLS 353	Yes
BIOLS 354	Mycology	2	3	3	ME	BIOLS 222 & BIOLS 250	Yes
BIOLS 433	Entomology	2	3	3	ME	BIOLS 232	Yes
BIOLS 491	Seminar	2	0	2	ME	Department Approval	Yes
BIOLS 341	Principles of Environmental Science	2	3	3	ME	BIOLS 103	Yes
BIOLS 441	Environmental Impact Assessment	2	3	3	ME	BIOLS 340	Yes
BIOLS 442	Conservation Biology	2	3	3	ME	BIOLS 340	Yes
BIOLS 451*	Immunology	2	3	3	ME	BIOLS 250	Yes
BIOLS 499*	Senior Research Project	0	9	3	ME	Department Approval	Yes

***BIOLS 451 & BIOLS 499 are MR for Single Track Program & ME for Major Program.**

General Studies Elective Courses List

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		LEC	PRAC	CRD		
ARAB 141	Modern Arabic Lit.	3	0	3	GSE	------
ARAB 242	Arabic Poetry In The Renaissance Period	3	0	3	GSE	------
ART 133	Fundamentals of Music and Its Appreciation	3	0	3	GSE	------
ART 141	Drawing and Painting	2	1	3	GSE	------
ART 221	Traditional Music of Bahrain and Its Application	3	0	3	GSE	------
CHL 101	Introduction to Chinese Language	3	0	3	GSE	------
CHL 102	Basic Chinese Language	3	0	3	GSE	CHL 101
EDAR 126	Playing on Piano and Org 1	3	0	3	GSE	------
EDPS 144	Psychology of Learning and Memory	3	0	3	GSE	------
EDTC 100	Teaching and Learning Technology	3	0	3	GSE	------
ENGL 130	Introduction to Literature	3	0	3	GSE	------
FREN 141	French I	3	0	3	GSE	------
FREN 142	French II	3	0	3	GSE	FREN 141
GERM 101	Introduction to German	3	0	3	GSE	------
HISTO 212	Contemporary History of The Arab World	3	0	3	GSE	------
HISTO 281	Landmarks of Islamic Civilisation	3	0	3	GSE	------
ISLM 114	Quranic Sciences	3	0	3	GSE	------
ISLM 136	Biography of The Prophet	3	0	3	GSE	------
ISLM 141	Introduction to Shari'A	3	0	3	GSE	------
ISLM 252	Islamic Doctrine	3	0	3	GSE	------
JAPN 101	Japanese Level I	3	0	3	GSE	------
JAPN 102	Japanese Level II	3	0	3	GSE	JAPN 101
KL 101	Korean Language I	3	0	3	GSE	------
KL 102	Korean Language II	3	0	3	GSE	KL 101
LAW 101	Introduction to Legal Studies	3	0	3	GSE	------
LAW 102	History of Law	3	0	3	GSE	------
LAW 106	Constitutional Law I	3	0	3	GSE	------
PHEDE 214	Principles of Educational Statistics	3	0	3	GSE	------
PSYC 103	Introduction to Psychology	3	0	3	GSE	------
PSYC 120	Psychology of Marriage	3	0	3	GSE	------
PSYC 211	Educational Psychology	3	0	3	GSE	------
PSYC 281	Thinking Skills	3	0	3	GSE	PSYC 103 or EDPS 241
SOCIO 161	Introduction to Sociology	3	0	3	GSE	------
SOCIO 181	Introduction to Anthropology	3	0	3	GSE	------
SOCIO 191	Citizenship, Identity and Globalization	3	0	3	GSE	------
SOCIO 224	Sociology of Health	3	0	3	GSE	------
SOCIO 226	Sociology of Arabian Gulf	3	0	3	GSE	------
TL 101	Turkish Language	3	0	3	GSE	------
GSE XXX	Other electives	X	X	3	GSE	Department Approval

Course Description

Course Code: BIOLS 103 **Course Title**: General Biology II
Classification of organisms; plant structure and function; animal structure and function; evolutionary theory; ecology and modern biological problems.

Course Code: BIOLS 105 **Course Title:** Current Topics in Human and Environmental Biology
Some basic concepts of biology, natural habitats, human impact on the environment, pollution, food, diet and food poisoning, disease reservoirs, examples of diseases, public health measures for the control of epidemics. (Open for arts and educations students only)

Course Code: BIOLS 222 **Course Title:** Plant Morphology
The organography, anatomy and methods of reproduction of the major divisions and classes of algae, fungi, liverworts, mosses, ferns, gymnosperms and angiosperms; the study of the monocotyledonous and dicotyledonous families.

Course Code: BIOLS 232 **Course Title:** Invertebrate Zoology I
Classification, biology, diversity, structural features and phylogeny of major lower and higher taxonomic groups of invertebrates.
Course Code: BIOLS 234 **Course Title:** Chordate Zoology
Classification and biology of chordates: protochordates, hemichordates, urochordates, cephalochordates and vertebrates.
Course Code: BIOLS 250 **Course Title:** Microbiology
Microbial world and its development; scope of microbiology; microbial taxonomy and nomenclature; morphology and fine structure; microbial growth and metabolism; control of microorganisms; microorganisms and diseases; exploitation of microorganisms by man.

Course Code: BIOLS 271 **Course Title:** The Human Body
Human anatomy and physiology in relation to health and disease. (Open to Arts students only.)

Course Code: BIOLS 300 **Course Title**: Cell Biology
Structural and chemical basis of cell functions, including energy and matter conversion; transport across cell membranes, excitability, contractility, internal membrane of cytoskeleton.

Course Code: BIOLS 315 **Course Title:** Biochemistry
Principles of biological chemistry; the chemistry of water, acids and bases, and buffer control of pH. Protein structure and function; principles of enzymology, and carbohydrate, lipid, and nucleic acid structure and function. Basic intermediate metabolism including: protein, carbohydrate and lipid synthesis and breakdown; Kreb's cycle and oxidative phosphorylation; pentose phosphate pathway and the process of photosynthesis.

Course Code: BIOLS 320 **Course Title:** Plant Physiology
Water relations; uptake and accumulation of solutes; mineral nutrition; photosynthesis; respiration; nitrogen metabolism; growth and growth hormones; environmental stress.

Course Code: BIOLS 321 **Course Title:** Plant Anatomy
The internal structure of seed plants; description and recognition of cell and tissue types; tissue systems and their interrelations in vegetative and reproductive structures. Developmental changes of the plant body from the embryo to mature plant and from meristems to mature tissues.

Course Code: BIOLS 322 **Course Title**: Economic Botany
Algae, bacteria and fungi and their uses as food, in diseases, destructive distillation and fermentation; agar and algin production. Fibre plants and fibre industry; starch and sugar industry; vegetable fats and oils; spices and medicinal plants.

Course Code: BIOLS 324 **Course Title:** Plant Taxonomy
Different systems of classification of the flowering plants; adopting a suitable system; studying different examples of families representing Monocotyledoneae and Dicotyledoneae.

Course Code: BIOLS 325 **Course Title:** Phycology
The taxonomy, molphology, reproduction, ecology and evolution of various algal groups with special emphasis placed on the algae of Bahrain.

Course Code: BIOLS 330 **Course Title:** Parasitology
History of parasitology; parasites and human populations; evolution of parasitism; general characteristics of parasites; the biology, epidemiology and control of selected parasites.

Course Code: BIOLS 333 **Course Title:** Invertebrate Zoology II
Course Code: BIOLS 105 Course Title: Current Topics in Human and Environmental Biology
Detailed aspects of the classification, ecology, physiology, development, radiation and evolution of selected major invertebrate groups.

Course Code: BIOLS 334 **Course Title:** Comparative Chordate
A detailed comparative study to show the development in structure and function of the different systems: integumentary, digestive, respiratory, excretory, reproductive, endocrine, skeletal, muscular, circulatory, nervous, receptor organs.
Course Code: BIOLS 340 **Course Title**: General Ecology
Concept of ecosystems, including the physical and biological environments; communities; succession; climax communities; energy cycles; food webs; mineral cycles; water cycles; the inter-relationships between living organisms and their physical environment.

Course Code: BIOLS 341 **Course Title**: Principles of Environmental Science
Key concepts and principles of environmental science, including environmental systems, species population, human population, biomass and biodiversity, environmental resources and conservation, environmental health, pollution, and environmental sustainability.

Course Code: BIOLS 352 **Course Title:** Applied Microbiology
Foods as substrates for microorganisms; microorganisms important in food and fermentation industries; contamination, spoilage and preservation of foods. Single cell protein production; secondary metabolite production; antibiotics, a1cohols, amino acids, enzymes, microbial toxins. New approaches to improve novel metabolite production through modern microbial biotechnology techniques

Course Code: BIOLS 353 **Course Title:** Virology
Bacterial and animal virus structures; biochemistry; replication; gene regulation; virus host interaction.

Course Code: BIOLS 354 **Course Title:** Mycology
Taxonomy, morphology, life histories, physiology, genetics and economic importance of the principal groups of fungi.
Course Code: BIOLS 356 **Course Title:** Soil Microbiology
Ecology of soil microorganisms; microbial biomass; community structure; quality control and quality assurance; bioremediation of soil.
Course Code: BIOLS 360 **Course Title:** Principles of Genetics
DNA and RNA; replication; translation and its code; regulation of gene expression; Mendelian vs. non-mendelian inheritance; mapping the eucaryotic chromosome; sex determination and differentiation; genes and environment; mutation and mutagenesis; immunogenetics; an introduction to population genetics.

Course Code: BIOLS 370 **Course Title:** Animal Physiology
Anatomy and physiology of Man with special emphasis on the integumentary, skeletal, muscular, digestive, respiratory, excretory, reproductive, circulatory, endocrine and nervous systems. In each case the contribution of the system to general homeostasis will be discussed.

Course Code: BIOLS 371 **Course Title:** Principles of Nutrition
Digestion, absorption and metabolism of essential nutrients; energy values of food; primary nutritional diseases; diet; physiological stress; socio-economic factors influencing food habits in Bahrain.

Course Code: BIOLS 372 **Course Title:** Human Physiology
Anatomy and physiology of Man with special emphasis on the integumentary, skeletal, muscular, digestive, respiratory, excretory, reproductive, circulatory, endocrine and nervous systems. In each case the contribution of the system to general homeostasis will be discussed.

Course Code: BIOLS 380 **Course Title:** Marine Biology
Basic principles of marine biology; evolution of the sea basins; marine biota's and their ecology; seawater chemistry and marine pollution. Field and laboratory work is an integral part of the course.

Course Code: BIOLS 383 **Course Title:** Oceanography
Emphasizes its multi-disciplinary nature which includes sea water temperature and salinity; water masses and circulation; tides; major and minor components of sea water; organisms in the ocean, planktonic and benthic; the nekton. Practical classes are an essential part of the course.

Course Code: BIOLS 385 **Course Title:** Marine Pollution
Definition of pollution; types of marine pollution with emphasis on oil, sewage, thermal pollution and land reclamation; ecological and economic effect. Monitoring, analysis and control of pollution would be discussed in particular to the Arabian Gulf region.

Course Code: BIOLS **398** **Course Title:** Internship
The Internship course is designed to provide an opportunity to gain work experience related to the student's specified field of science, in a supervised workplace environment for a period of 8 consecutive weeks. The student shall submit a report upon completion.

Course Code: BIOLS 402 **Course Title:** Organic Evolution
Basic mechanisms of evolution including factors causing variation; recombination and mutation; selection pressures; speciation and hybridization; mimicry; continental drift; extinction's; a survey of major changes occurring in plants and animals during geologic time.

Course Code: BIOLS 404 **Course Title:** Biotechnology
Basic principles of biotechnology; microbial screening and strain improvement; biological regulation; transport phenomena and bioreactor design. Microbial biomass and protein source, anaerobic digestion, industrial alcohol production and purification of fine enzymes. Production of antibiotics; genetic engineering and its applications; plant and animal cell culture techniques.

Course Code: BIOLS 405 **Course Title:** Fermentation Biotechnology
Fermentation as an ancient art; biology of industrial microorganisms; fermentation systems; fermentation raw materials; down-stream processing; biomass production; industrial enzymes.

Course Code: BIOLS 406 **Course Title:** Bioremediation of Pollutants
Microbial degradation of xenobiotics; biodegradation pathways; bioremediation of liquid wastes; bioremediation of solid wastes. Biomass utilization.

Course Code: BIOLS 407 **Course Title**: Protein Biotechnology
The scope of protein Biotechnology; protein sources; therapeutic proteins; proteins for diagnostic purposes; polymer-degrading enzymes of industrial significance; other proteins of industrial significance.

Course Code: BIOLS 408 **Course Title:** Biotechnology of Antibiotic industry
Antibiotic search and production. Biology of antibiotic formation. Antibiotics in medical practice: antibacterial, antifungal, antitumor and antiviral antibiotics. Antibiotics in agricultural practice.

Course Code: BIOLS 409 **Course Title:** Biotechnology and Development
Promises of biotechnology for developing countries; agriculture horticulture forestry; Importance of plant genetic resources; food and nutrition; medicine and public health; production of pharmaceuticals, Energy production; pollution control.

Course Code: BIOLS 423 **Course Title:** Plant Growth Hormones
Growth and development of the higher plants; auxins, gibberellins, cytokinins, abscisic acid; transport of growth regulators; photosynthate partitioning; apical dominance; tropisms; phytochrome systems; photoperiodism and vemalisation; bud and seed; dormancy; seed germination; circadian rhythms; senescence and post-harvest changes; effects of stresses. Tissue culture and micropropagation.

Course Code: BIOLS 424 **Course Title:** Algal Ecology
The environment; habitat and communities; phytobenthos; phytoplankton; succession; energy flow; distribution and phytogeography; eutrophication and pollution.

Course Code: BIOLS 425 **Course Title:** Terrestrial Plant Ecology
Species, ecotypes; population structure and dynamics; species interactions; community structure and dynamics; environmental factors; biotopes.

Course Code: BIOLS 426 **Course Title:** Horticulture
Plant culture- herbs, shrubs and trees. Clonal propagation. Grafting techniques. Nutrition, deficiency syndrome, toxicity symptoms. Irrigation techniques: drip flooding .. etc. Eater supplies - TSE and other water supplies. Shade- use in crop plants. Economics of horticultural production.

Course Code: BIOLS 427 **Course Title:** Stress Physiology
The unstressed plant and comparisons with stressed plants, drought, water logging, salinity, nutrition, toxic elements, radionucleotides etc. Plant animal interaction. Economics of stress effects on crop plants.

Course Code: BIOLS 428 **Course Title:** Plant Biodiversity
Plant population dynamics. Plant productivity. Plant and aridity. Plant animal interaction and environmental issues such as greenhouse, salinity, dieback and logging.

Course Code: BIOLS 429 **Course Title:** Marine and Fresh water Botany
The biology and diversity of algal protests; the evolution and phylogeny of protests; distribution and ecology of aquatic plants; aquatic environments and global ecology; the commercial utilization of marine algal ecology.

Course Code: BIOLS 432 **Course Title:** Embryology
Examination of the ontogeny of selected vertebrate species and the development of organs and tissues from embryonic germ layers.
Course Code: BIOLS 433 **Course Title:** Entomology
Morphology, physiology and control (physical, biological and chemical) of common insects.

Course Code: BIOLS 438 **Course Title:** Endocrinology
The structure of hormones; mechanism of their action; control of growth, maturation, reproduction, behaviour and chemical homeostasis. Discussion covers hormones of the pancreatic islets; parathyroid glands, hypothalamus and pituitary glands, thyroid gland, adrenal gland and reproductive glands. Emphasis on the endocrine control of metabolism. Reference to major endocrine diseases will be made where necessary.

Course Code: BIOLS 441 **Course Title:** Environmental Impact Assessment
Key principles of Environmental Impact Assessment (EIA) process; impact prediction and evaluation, mitigation, monitoring, effectiveness, and strategic environmental assessment.

Course Code: BIOLS 442 **Course Title**: Conservation Biology
Principles of conservation; including biological biodiversity and its value, the threats to biological diversity, conservation at the population and species levels, protecting and managing habitats and ecosystems, and sustainable development.

Course Code: BIOLS 451 **Course Title**: Immunology
Production and function of immunoglobulin, characteristics of immunogens; prevention of infectious disease; hypersensitivity and allergy; cell-mediated immunity; transplantation and autoimmune diseases.

Course Code: BIOLS 452 **Course Title**: Biology of Prokaryotes
Diversity among prokaryotes; heterogeneity of form and function, cyanobacteria; eubacteria; archaebacteria; actinomycetes.

Course Code: BIOLS 454 **Course Title**: Advanced Virology
Advanced concepts in molecular virology, including the viral lifecycle, virus-host interactions, viral control and antiviral agents, viral immunology, and viral epidemiology; with emphasis on major families of pathogenic viruses.

Course Code: BIOLS 456 **Course Title**: Microbial Ecology

Microorganisms in nature; methods in microbial ecology; aquatic habitats; terrestrial environments; global biogeochemical cycles; biodegradation of xenobiotics; petroleum and natural gas (methane) biodegradation; plant-microbe interactions; microbe-microbe interactions.

Course Code: BIOLS 457 **Course Title**: Plant Pathology
Nature, importance and control of plant diseases caused by fungi, bacteria, viruses and nematodes; principles of plant disease control.

Course Code: BIOLS 460 **Course Title**: Human Genetics
Human genome; mapping of human genome; mode of inheritance of some disorders; blood genetics; genes and cancer; prevention of genetic disease; treatment of genetic disease; heredity and environment; genetic counseling; genetics of race and species formation.

Course Code: BIOLS 461 **Course Title**: Plasmid and Recombinant DNA
Classification of plasmids; plasmids for genetic manipulation, plasmids in medicine and agriculture; different aspects of recombinant DNA technology: gene transfer in microbial, animal and plant systems.

Course Code: BIOLS 463 **Course Title**: Theme course in Molecular Biology
This course covers recent topics in molecular and cellular biology with more emphasis on eukaryotic system. Main topics include: cell cycle, cycle, aging, cancer etc.

Course Code: BIOLS 464 **Course Title**: Molecular Biology of Oncogenes
Oncogenes; anti-oncogenes; genetic structure of oncogenes; regulation and biochemical properties of their encoded proteins.

Course Code: BIOLS 465 **Course Title**: Gene Technology
Perpetuation of DNA; fine structure of the gene; mapping bacterial and viral chromosomes; transposition. Gene cloning: isolation and characterization of DNA and the gene, development of cloning vectors, in vitro mutagenesis; introduction of different vectors to prokaryotes and eucaryotes.

Course Code: BIOLS 466 **Course Title**: Molecular Mechanisms of Bacterial Pathogenesis
Introduction to genetics of bacterial pathogens in plant and animals with emphasis on gene regulation and molecular diagnostic techniques. This course introduces students of the basic key factors involved in bacterial pathogenesis. Selected examples of human, animal and plant pathogens are used to illustrate the molecular basis of bacterial pathogenesis. Development of laboratory techniques in diagnostic microbiology (such as identification of bacterial strains by molecular methods, the use of microbial bioinformatics tools in genome comparisons and analysis.

Course Code: BIOLS 467 **Course Title**: Plant Tissue Culture
This course is intended to introduce students to the principles, protocols and utilization of plant cell, tissue and organ culture. Hands-on laboratory experience will be the primary goal of the course. The theme of the course includes covering recent topics in-vitro propagation techniques, plant improvement and special applications of plant tissue culture in modern laboratories.

Course Code: BIOLS 468 **Course Title**: Animal Tissue Culture
Intensive lectures and laboratory works designed to provide the students with the knowledge related to the in-vitro techniques used for the propagation and maintenance of animal cells, tissue and hybridoma cultures.

Course Code: BIOLS 471 **Course Title**: Nutrition through human life cycle
Covers the basic nutrient needs and health concerns of individuals for each of the major stages of the human life cycle (infancy, childhood, adolescence, adulthood and elderly people) and the special nutritional requirements during pregnancy and lactation.

Course Code: BIOLS 474 **Course Title**: Comparative Animal Physiology
The significance of all physiological mechanisms in the ecological theater will be viewed with evolutionary perspective. Emphasis on the interrelationships between animals and their environment; relations between form and function; similarities and differences among vertebrates and invertebrates in achieving homeostasis.

Course Code: BIOLS 481 **Course Title**: Fish and Fisheries
Forms and structures. Feeding; respiration; hydromineral balance and growth; reproductive biology. Behaviour of fishes; fish parasites; evolution and classification; ecology and zoo geography. History of fisheries; fish farming and Arabian Gulf fish and fisheries.

Course Code: BIOLS 482 **Course Title**: Marine Ecology of the Arabian Gulf
The various and distinct marine habitats of the Arabian Gulf: mud flats, mangroves, coral reefs, sand/rock beaches. The unique interrelationships (biological, geological, chemical and physical) of the area will be stressed. Field work is an integral part of the course.

Course Code: BIOLS 491 **Course Title**: Seminar
Students should give two seminars on selected biological topics.

Course Code: BIOLS 499 **Course Title**: Senior Research Project
Oral and written presentation and defense of practical project carried out by the student under supervision.

Minor in Astronomy for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 282	The Cosmic Perspective	3	0	3	Minor	PHYCS 102	Yes
PHYCS 283	Planets and the Solar System	3	0	3	Minor	PHYCS 282	Yes
PHYCS 381	Stellar Astrophysics	3	0	3	Minor	PHYCS 283	Yes
PHYCS 384	Galaxies and the Universe	3	0	3	Minor	PHYCS 381	Yes
PHYCS 385	Observational Astronomy	3	2	3	Minor	PHYCS 381	Yes
PHYCS 3/4XX*	(see the list below)	3	0	3	Minor	See the list below	Yes
PHYCS 3/4XX*	(see the list below)	3	0	3	Minor	See the list below	Yes

***Students should select electives 3/4XX from the following list:**

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 383	Space Science and Technology	3	0	3	Minor	PHYCS 102	Yes
PHYCS 481	Solar System Dynamics	3	0	3	Minor	PHYCS 283	Yes
PHYCS 482	High-Energy Astrophysics	3	0	3	Minor	PHYCS 384	Yes
PHYCS 483	Extragalactic Astrophysics and Cosmology	3	0	3	Minor	PHYCS 384	Yes
PHYCS 485	Astronomical Data Analysis	3	2	3	ME	PHYCS 385	Yes

Minor in Chemistry for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 102*+	General Chemistry II	3	3	4	Minor	CHEMY 101	Yes
CHEMY 2XX**	Minor 2 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	CHEMY 102	Yes
CHEMY 2XX**	Minor 3 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	CHEMY 102	Yes
CHEMY 3/4XX	Minor 4 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
CHEMY 3/4XX	Minor 5 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
CHEMY 3/4XX	Minor 6 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
CHEMY 3/4XX	Minor 7 to be taken from Chemistry: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
+ If it is part of the major requirements it needs to be replaced by another course of the same level or higher. *CHEMY 103 (2 credit hours only) is Not Accepted as substitute.							
** CHEMY 223 (Organic Chemistry for Biology) is Not Accepted as substitute.							

List of Electives for Minor Chemistry

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 211	Analytical Chemistry I	3	2	3	Minor	CHEMY 102	Yes
CHEMY 221	Organic Chemistry I	3	2	3	Minor	CHEMY 102	Yes
CHEMY 231	Physical Chemistry I	3	2	3	Minor	CHEMY 102	Yes
CHEMY 241	Inorganic Chemistry I	3	2	3	Minor	CHEMY 102	Yes
CHEMY 300	Professional and Transferable Skills for Chemists	3	0	3	Minor	CHEMY 102	Yes
CHEMY 311	Analytical Chemistry II	3	0	3	Minor	CHEMY 211	Yes
CHEMY 321	Organic Chemistry II	3	0	3	Minor	CHEMY 221	Yes
CHEMY 331	Physical Chemistry II	3	0	3	Minor	CHEMY 231	Yes
CHEMY 332	Practical Physical Chemistry	0	6	3	Minor	CHEMY 331	Yes
CHEMY 333	Quantum Chemistry	3	0	3	Minor	CHEMY 201 or MATHS 122	Yes

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 341	Inorganic Chemistry II	3	0	3	Minor	CHEMY 241	Yes
CHEMY 348	Industrial Inorganic Chemistry	3	0	3	Minor	CHEMY 241	Yes
CHEMY 351	Principles and applications of Green Chemistry	3	0	3	Minor	CHEMY 211 & CHEMY 221	Yes
CHEMY 422	Physical Organic Chemistry	3	0	3	Minor	CHEMY 321	Yes
CHEMY 423	Selected Topics in Heterocyclic Chemistry	3	0	3	Minor	CHEMY 321	Yes
CHEMY 424	Natural Products	2	3	3	Minor	CHEMY 321	Yes
CHEMY 425	Mechanism in organic Chemistry	3	0	3	Minor	CHEMY 321	Yes
CHEMY 426	Food Chemistry	2	3	3	Minor	CHEMY 321	Yes
CHEMY 428	Industrial Organic Chemistry	3	0	3	Minor	CHEMY 321	Yes
CHEMY 431	Chemical Dynamics: Catalyst and Surface Chemistry	3	0	3	Minor	CHEMY 331	Yes
CHEMY 434	Polymer Chemistry	2	3	3	Minor	CHEMY 321	Yes
CHEMY 435	Advance Thermodynamics	3	0	3	Minor	CHEMY 331	Yes
CHEMY 438	Electrochemistry	3	0	3	Minor	CHEMY 331	Yes
CHEMY 442	Bio-inorganic Chemistry	2	3	3	Minor	CHEMY 341	Yes
CHEMY 443	Inorganic Reaction Mechanisms	3	0	3	Minor	CHEMY 341	Yes
CHEMY 452	Environmental Chemistry	2	3	3	Minor	CHEMY 312	Yes
CHEMY 453	Organic Environmental Chemistry	2	3	3	Minor	CHEMY 322	Yes
CHEMY 441	Application of Group Theory of Inorganic Chemistry	3	0	3	ME	CHEMY 341	Yes
CHEMY 411	Analytical Chemistry III	3	0	3	ME	CHEMY 311	Yes
CHEMY 432	Physical Chemistry III	3	0	3	ME	CHEMY 331	Yes
CHEMY 421	Organic Chemistry III	3	0	3	ME	CHEMY 321	Yes

Minor in Computer Science for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 114	Computer Programming II	3	2	3	Minor	ITCS 113	Yes
ITCS 214	Data Structures	3	2	3	Minor	ITCS 114	Yes
ITCS 285	Database Management Systems	3	2	3	Minor	ITCS 214	Yes
ITCS 316	Human-Computer Interaction	3	2	3	Minor	ITCS 214	Yes
ITCS 389	Software Engineering I	3	2	3	Minor	ITCS 285	Yes
ITCS* 3/4XX	(see the list below)	3	2	3	Minor	See the list below	Yes
ITCS* 3/4XX	(see the list below)	3	2	3	Minor	See the list below	Yes

List of Electives for Minor Computer Science

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 333	Internet Software Development	3	2	3	Minor	ITCS 285	Yes
ITCS 444	Mobile Application Development	3	2	3	Minor	ITCS 333	Yes
ITCS 453	Multimedia and Hypermedia Systems	3	2	3	Minor	ITCS 214	Yes
ITCS 489	Software Engineering II	3	2	3	Minor	ITCS 389	Yes
ITCS 494	Selected Topics in Computer Science	3	2	3	Minor	Department Approval	Yes
ITCS 496	Physical Implementation of DBMS	3	2	3	Minor	ITCS 285	Yes

Minor in Mathematics for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 204	Calculus and Analytic Geometry III	3	0	3	Minor	MATHS 122	Yes
MATHS 205	Calculus and Analytic Geometry III OR Differential Equations	3	0	3	Minor	MATHS 122	Yes
MATHS 211	Linear Algebra	3	0	3	Minor	MATHS 121	Yes
MATHS 3/4XX	Minor 4 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 5 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 6 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 7 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes

List of Electives for Minor Mathematics

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 303	Analysis I	3	0	3	Minor	MATHS 204	Yes
MATHS 304	Analysis II	3	0	3	Minor	MATHS 303	Yes
MATHS 305	History of Mathematics	3	0	3	Minor	-----	Yes
MATHS 307	Introduction to Lie Group for Differential Equations	3	0	3	Minor	MATHS 204 & MATHS 205	Yes
MATHS 311	Abstract Algebra I	3	0	3	Minor	MATHS 211	Yes
MATHS 312	Abstract Algebra II	3	0	3	Minor	MATHS 311	Yes
MATHS 331	Numerical Analysis I	3	0	3	Minor	MATHS 122 & (ITCS 114 or ITCS 102)	Yes
MATHS 332	Numerical Analysis II	3	0	3	Minor	MATHS 331	Yes
MATHS 341	Complex Analysis I	3	0	3	Minor	MATHS 204	Yes
MATHS 352	Number Theory	3	0	3	Minor	MATHS 121	Yes
MATHS 381	Methods of Applied Mathematics	3	0	3	Minor	MATHS 204 & MATHS 205	Yes

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 385	Analytical Mechanics	3	0	3	Minor	MATHS 204 & MATHS 205	Yes
MATHS 387	Fluid Mechanics	3	0	3	Minor	MATHS 385	Yes
MATHS 388	Vector Analysis and Tensor Analysis	3	0	3	Minor	MATHS 204	Yes
MATHS 395	Problem Solving in Mathematics	3	0	3	Minor	MATHS 381	Yes
MATHS 401	Applied Mathematics I	3	0	3	Minor	MATHS 381	Yes
MATHS 402	Applied Mathematics II	3	0	3	Minor	MATHS 401	Yes
MATHS 405	Theory of Differential Equations	3	0	3	Minor	MATHS 205	Yes
MATHS 411	Commutative Algebra	3	0	3	Minor	MATHS 312	Yes
MATHS 415	Topology I	3	0	3	Minor	MATHS 253 & MATHS 303	Yes
MATHS 416	Topology II	3	0	3	Minor	MATHS 415	Yes
MATHS 417	Functional Analysis	3	0	3	Minor	MATHS 211 & MATHS 303	Yes
MATHS 441	Complex Analysis II	3	0	3	Minor	MATHS 341	Yes
MATHS 451	Topics in Geometry	3	0	3	Minor	MATHS 253	Yes
MATHS 452	Differential Geometry	3	0	3	Minor	MATHS 204	Yes
MATHS 461	Elementary Partial Differential Equation	3	0	3	Minor	MATHS 204 & MATHS 205	Yes

Minor in Physics for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 209	Bulk Properties of Matter	3	2	3	Minor	PHYCS 101	Yes
PHYCS 221	Methods of Mathematical Physics I	3	0	3	Minor	PHYCS 102 & MATHS 122	Yes
PHYCS 222	Modern Physics	3	2	3	Minor	PHYCS 102	Yes
PHYCS 324	Atomic and Molecular Physics	3	2	3	Minor	PHYCS 222	Yes
PHYCS 3XX*	Any course from List 1	X	X	3	Minor	See the list 1 below	Yes
PHYCS 3/4XX**	Any course from the list 2	X	X	3	Minor	See the list 2 below	Yes
PHYCS 3/4XX**	Any course from the list 2	X	X	3	Minor	See the list 2 below	Yes

List 1: Electives for Minor Physics

Students should select one course from the following courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 314	Classical Mechanics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 326	Quantum Mechanics I	3	2	3	Minor	PHYCS 222	Yes
PHYCS 348	Electromagnetic Theory	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 365	Thermal Physics	3	2	3	Minor	PHYCS 209	Yes

List 2: Electives for Minor Physics

Students should select two courses 3/4XX from the following courses

If Student did not register PHYCS 102 as major support course, then he/she has to register it as minor.

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 102	General Physics II	3	3	4	Minor	PHYCS 101	Yes
PHYCS 314	Classical Mechanics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 331	Physical Optics	3	2	3	Minor	PHYCS 102	Yes
PHYCS 348	Electromagnetic Theory	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 365	Thermal Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 351	Solid State Physics I	3	2	3	Minor	PHYCS 222	Yes
PHYCS 425	Computational Physics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 471	Nuclear Physics	3	2	3	Minor	PHYCS 326	Yes
PHYCS 333	Oscillations and Waves	3	2	3	Minor	PHYCS 221	Yes
PHYCS 344	Plasma Physics	3	0	3	Minor	PHYCS 348	Yes
PHYCS 353	Physics of Materials	3	2	3	Minor	PHYCS 209	Yes
PHYCS 364	Meteorology	3	2	3	Minor	PHYCS 209	Yes
PHYCS 366	Environmental Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 382	Astronomy	3	0	3	Minor	PHYCS 102	Yes
PHYCS 383	Space Science and Technology	3	0	3	Minor	PHYCS 102	Yes
PHYCS 408	Medical Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 421	Mathematical Physics	3	0	3	Minor	PHYCS 221	Yes
PHYCS 422	Particle Physics	3	0	3	Minor	PHYCS 326	Yes
PHYCS 427	Quantum Mechanics II	3	0	3	Minor	PHYCS 326	Yes
PHYCS 428	Space and Time	3	0	3	Minor	PHYCS 222 & PHYCS 314	Yes
PHYCS 444	Electrodynamics	3	0	3	Minor	PHYCS 348	Yes
PHYCS 462	Statistical Physics	3	0	3	Minor	PHYCS 365	Yes
PHYCS 465	Solar Energy	3	2	3	Minor	PHYCS 365	Yes
PHYCS 492	Selected Topics in Modern Physics	3	0	3	Minor	Department Approval	Yes

Minor in Statistics for Biology Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 211	Linear Algebra	3	0	3	Minor	MATHS 121	Yes
STAT 271	Introduction to Probability	3	0	3	Minor	MATHS 121	Yes
STAT 371	Probability and Statistics I	3	0	3	Minor	MATHS 122 & STAT 271	Yes
STAT 372	Probability and Statistics II	3	0	3	Minor	STAT 371	Yes
STAT 373	Statistical Packages and Simulation	3	0	3	Minor	STAT 271	Yes
STAT 3/4XX	Minor 6 to be taken from Statistics: Major Requirements or Major Electives courses List	3	0	3	Minor	See the list below	Yes
STAT 3/4XX	Minor 7 to be taken from Statistics: Major Requirements or Major Electives courses List	3	0	3	Minor	See the list below	Yes

List of Electives for Minor Statistics

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
STAT 374	Regression Analysis	3	0	3	Minor	MATHS 211 & STAT 372	Yes
STAT 378	Surveys and Sampling	3	0	3	Minor	STAT 371	Yes
STAT 381	Time Series Analysis	3	0	3	Minor	STAT 372	Yes
STAT 382	Biostatistics and Epidemiology	3	0	3	Minor	MATHS 121	Yes
STAT 383	Demography and Population Studies	3	0	3	Minor	MATHS 121	Yes
STAT 384	Bayesian Inference	3	0	3	Minor	STAT 371	Yes
STAT 385	Econometrics	3	0	3	Minor	ECON140 & STAT 271	Yes
STAT 391	Non-Parametric Statistics	3	0	3	Minor	STAT 271	Yes
STAT 392	Operational Research I	3	0	3	Minor	MATHS 211	Yes
STAT 393	Operational Research II	3	0	3	Minor	STAT 392	Yes
STAT 394	Linear programming	3	0	3	Minor	MATHS 122 & STAT 271	Yes
STAT 471	Decision Theory	3	0	3	Minor	STAT 372	Yes
STAT 472	Analysis and Design of Experiments	3	0	3	Minor	STAT 372	Yes
STAT 473	Introduction to Multivariate Analysis	3	0	3	Minor	MATHS 211 & STAT 372	Yes
STAT 474	Statistical Modelling	3	0	3	Minor	STAT 372	Yes
STAT 476	Queuing systems	3	0	3	Minor	STAT 372	Yes
STAT 478	Introduction to Stochastic Processes	3	0	3	Minor	STAT 372	Yes
STAT 479	Reliability	3	0	3	Minor	STAT 372	Yes

Major Support Requirements Courses Descriptions

Course Code: MATHS 122 **Course Title:** Calculus and Analytic Geometry II
Methods of integration. Applications to areas; arc length; volumes; etc. Parametric equations. Polar coordinates. Infinite series. Taylors' theorem and power series.

Course Code: PHYCS 102 **Course Title:** General Physics II
Electric charges and fields; Coulomb's and Gauss's laws; electric potential; capacitors and dielectrics; direct current circuits; Kirchoff's rules; magnetic field and flux; ampere's law; induced emf; Lenz's law; mutual and self inductance; AC circuits; RLC circuit.

Course Code: CHEMY 102 **Course Title:** General Chemistry II
Gaseous equilibrium (equilibrium constant, Kc and Kp); acids and bases (water dissociation, pH, weak acids and bases, salts); acid-base and precipitation equilibria (buffers, indicators, titrations, pH curves);thermochemistry (calorimetry, enthalpy, thermochemical equations, heats of formation, first law of thermodynamics); rate of reaction, rate and concentration, concentration and time, activation energy, rate and temperature, catalysis, mechanisms; electrochemistry; voltaic cells; cell voltages. Organic Chemistry (alkanes, alkenes, alkynes, isomerism, nomenclature, arenes, functional groups, reaction). Related practical work.

Course Code: CHEMY 223 **Course Title:** Organic Chemistry for Biological Sciences
Topics in organic chemistry that are essential for biology majors. Structure and bonding, the nature of organic compounds, alkanes, alkenes, alkynes, aromatic compounds, stereochemistry, alkyl halide, alcohols, ethers, phenols, aldehydes, ketones, nucleophilic addition reactions, carboxylic acids, amines, bimolecular carbohydrates, amino acids, peptides, proteins and lipids.

Course Code: STAT 272 **Course Title:** Biostatistics
Descriptive statistics, some basic probability concept, discrete and continuous probability distribution, estimation, hypothesis testing: one and two sample interference, analysis of variance, Inference of categorical data, simple linear and multiple regression and correlation, logistic regression, use statistical packages.

University Requirements Courses Descriptions

Course Code: ARAB 110 **Course Title:** Arabic Language Skills
This course focuses on basic Arabic skills including form, function, and meaning. It also helps the student to appreciate and understand structures and approach them from a critical point of view, through various genres in literature.

Course Code: HIST 122 **Course Title:** Modern History of Bahrain and Citizenship
Spatial identity of Bahrain: Brief history of Bahrain until the 18th century; the historical roots of the formation of the national identity of Bahrain since the 18th century; the modern state and evolution of constitutional life in Bahrain; the Arabic and Islamic dimensions of the identity of Bahrain; the core values of Bahrain's society and citizenship rights (legal, political, civil and economic); duties; responsibilities and community participation; economic change and development in Bahrain; Bahrain's Gulf, Arab and international relations.

Course Code: HRLC 107 **Course Title:** Human Rights Principles
This course deals with the principles of human rights in terms of the definition of human rights, scope, sources with a focus on the International Bill of Human Rights; The Charter of the United Nations; Universal Declaration of Human Rights; The International Covenant on Economics, Social and Culture rights; Convention against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment; Mechanics and the Constitutional Protection of Rights and Public Freedoms in Kingdom of Bahrain.

Course Code: ISLM 101 **Course Title:** Islamic Culture
An introduction to the general outline and principles of Islamic culture, its general characteristics, its relationships with other cultures, general principles of Islam in beliefs, worship, legislation and ethics.

College Requirement Courses Descriptions

Course Code: CHEMY 101 **Course Title:** General Chemistry I
Significant figures, chemical formulas and equations; mass relations, limiting reactants and theoretical yield; Physical behaviour of gases; electronic structure, periodic table, covalent bonding; Lewis structures, Molecular structures, hybridization; molecular orbitals, solutions; colligative properties. Related practical work.

Course Code: BIOLS 102 **Course Title:** General Biology I
Properties of life; atoms, molecules and chemical bonds; biomolecules; cell structure and function; bioenergetics (intermediary metabolism); cell reproduction; Mendelian genetics; structure of DNA; RNA and protein synthesis; molecular genetics.

Course Code: PHYCS 101 **Course Title:** General Physics I
Units and measurements; brief review of vectors; Newton's laws of motion; projectile motion; work and energy; impulse and momentum; rotational dynamics; equilibrium of a rigid body; periodic motion.

Course Code: MATHS 121 **Course Title:** Calculus and Analytic Geometry I
Limits and continuity. Derivatives and integrals. Applications of derivatives which include mean value theorem, extrema of functions and optimization. Definite integrals and the Fundamental Theorem of Calculus. Derivatives and integrals of exponential, logarithmic and inverse Trigonometric functions.

Course Code: ITCS 113 **Course Title:** Computer Programming I
This course introduces problem solving and fundamental programming concepts and techniques implemented by a high-level programming language. Topics include primitive and compound data types, syntax, semantics, expressions, assignment, input, output, conditional and iterative control structures, functions.

Course Code: ENGL 125 **Course Title:** English for Science I
This is the first of two integrated language courses designed specifically for science majors. Special attention is given to scientific vocabulary and the unique features of technical writing. The course includes an extensive reading programme via a self-access lab.

Course Code: ENGL 126 **Course Title:** English for Science II
English for Science is the second of two integrated language courses designed specifically for science majors. Special attention is given to scientific vocabulary and the unique features of technical writing.