



## Degree and Study Plan

College: Science  
Department: Earth Sciences  
Cohorts: 2016 - 2020  
Degree: Bachelor of Science  
Major: Earth Sciences  
Specialization:

### Summary of Credits:

<b>University Requirements (UR)</b>	<b>6</b>
Foundation Program	NC <sup>+</sup>
Arabic	3
Oman Contemporary Society	1
Oman & Islamic Civilization or Islamic Culture	2
<b>University Electives (UE)</b>	<b>6</b>
See List A	
<b>College Requirements (CR)</b>	<b>3</b>
See list B	
<b>College Electives (CE)</b>	<b>16</b>
See List C	
<b>Departmental Requirements (DR)</b>	<b>19</b>
See list D	
<b>Departmental Electives</b>	<b>6</b>
See list E	
<b>Major Requirements (AR)</b>	<b>45</b>
See list F	
<b>Major Electives (AE)</b>	<b>21</b>
See list G	
<b>Specialization Requirements (SR)</b>	
See list H	
<b>Specialization Electives (SE)</b>	
See list I	
<b>Minor Requirements (IR)</b>	<b>++</b>
See list J	
<b>Minor Electives (IE)</b>	<b>++</b>
See list K	
<b>TOTAL</b>	<b>122</b>

+ Not credited

++ Minor is optional: minimum total credits to earn a Minor are 18. Courses counting towards an approved Minor may substitute courses listed as Major Electives (List G) but no more than 8 credits counting towards the Major degree (lists C, D, E, F) may count towards a Minor.

For reference contact: Dr. Talal Al-Hosni Ext. 6833

HoD: Dr. Salah Al-Khribash Date 25 / 05 / 2016

Dean's Office: Prof. Salma Al Kindy Date 01 / 12 / 2016

Admission and Registration: Date / 12 / 2016

Last date of revision is May 15<sup>th</sup>, 2016



Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020

University Requirements (UR)	6
University Electives (UE)	6
College Requirements (CR)	3
College Electives (CE)	16
Departmental Requirements (DR)	19
Departmental Electives (DE)	6
Major Requirement (AR)	48
Major Electives (AE)	21
<b>TOTAL (Credit Hours)</b>	<b>122</b>

	Course Code	Course Title	Cr.	Pre-req./Co-req.*	Cat.
Semester 1 Fall	ERSC2101	Introduction to Geology I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604	CE
	LANC2058	Communication in Science	3	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604	CR
	CHEM2101	General Chemistry I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)	CE
	HIST1010 or ISLM1010	Oman & Islamic Civilization or Islamic Culture	2		UR
		University Elective	2		UE
	<b>Total</b>		<b>15</b>		

Semester 2 Spring	ERSC2102	Introduction to Geology II	4	ERSC2101	DR
	PHYS2101	General Physics I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109	CE
	MATH2107	Calculus I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109	CE
	ARAB1001	Arabic	3		UR
	SOCY1001	Oman Contemporary Society	1		UR
	<b>Total</b>		<b>16</b>		

Semester 3 Fall	ERSC2211	Paleontology I	3	ERSC2101 and LANC2058	AR
	ERSC3000	Environmental Geology	3	ERSC2101 and LANC2058	AR
	ERSC3010	Mineralogy	3	ERSC2102* and LANC2058	AR
		Department Elective	3		DE
		Major Elective	3		AE
	<b>Total</b>		<b>15</b>		

Semester 4 Spring	ERSC3021	Structural Geology	3	ERSC2102 and LANC2058	DR
	ERSC3041	Stratigraphy	3	ERSC2102 and LANC2058	DR
	ERSC3051	Igneous Petrology	3	ERSC3010 and LANC2058	AR
	ERSC3901	Sedimentary Petrology	3	ERSC2211 and ERSC3010	AR
		Major Elective	3		AE
	<b>Total</b>		<b>15</b>		

Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020

	Course Code	Course Title	Cr.	Pre-req./Co-req.*	Cat.
Semester 5 Fall	GEOP3041	General Geophysics	3	ERSC2101 and PHYS2101 and MATH2107 and LANC2058	DR
	ERSC3061	Remote Sensing	3	ERSC2102 and LANC2058	AR
	ERSC4012	Metamorphic Petrology	3	ERSC3051	AR
	ERSC4311	Sedimentary Environments & Facies	3	ERSC3901	AR
		Major Elective	3		AE
<b>Total</b>			<b>15</b>		

Semester 6 Spring	ERSC3031	Geology of Oman	3	ERSC3041 and LANC2058	DR
	ERSC4031	Geochemistry	3	ERSC2102 and CHEM2101	AR
	ERSC4071	Economic Geology	3	ERSC3051	AR
		Major Elective	3		AE
		Major Elective	3		AE
<b>Total</b>			<b>15</b>		

Semester 7 Fall	ERSC4001	Field Mapping Techniques	3	ERSC3021 and ERSC3901	AR
	ERSC4051	Hydrogeology	3	ERSC3000	AR
	ERSC5051	Petroleum Geology	3	ERSC3041	AR
		Major Elective	3		AE
		Department Elective	3		DE
<b>Total</b>			<b>15</b>		

Semester 8 Spring	ERSC4000	Field Mapping Project	3	ERSC4001	AR
	ERSC4040	Geological Interpretation of Well-logs	3	ERSC3041	DR
	ERSC5012	Sequence Stratigraphy	3	ERSC4311	AR
		Major Elective	3		AE
		University Elective	2		UE
		University Elective	2		UE
<b>Total</b>			<b>16</b>		

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Degree Plan : 122 credits</b>			
<b>Course code</b>	<b>Cr</b>	<b>Course Title</b>	<b>Prerequisites (Co-requisites)</b>
<b>University Requirements: 6 Credits</b>			
ARAB 1001	3	Arabic	
HIST1010 or ISLM1010	2	Oman & Islamic Civilization or Islamic Culture	
SOCY1001	1	Oman Contemporary Society	

**LIST A: University Electives (6 credits)**

See SQU Deanship of Admission and Registration website for the list of University Electives

**LIST B: COLLEGE REQUIRMENTS (3 credits)**

<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-Requisite / Co-req. *</b>
LANC 2058 <sup>†</sup>	Communication in Science	3	FPEL 0560 or FPEL0600 or FPEL0603 or FPEL0604
<b>Total</b>		<b>3</b>	

<sup>†</sup>LANC2058 is a pre-requisite for all 3000-level College of Science courses.

**LIST C: COLLEGE ELECTIVES (16 credits)**

<b>Code</b>	<b>Title</b>	<b>Credits</b>	<b>Pre-Requisite / Co-req. *</b>
BIOL2101	General Biology I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604
CHEM2101 <sup>†</sup>	General Chemistry I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
ERSC2101 <sup>†</sup>	Introduction to Geology I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604
COMP2101	Introduction to Computer Science	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604) and (FPCS0101 or PCS0102)
MATH2107	Calculus I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
PHYS2101 <sup>†</sup>	General Physics I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
STAT2101	Introduction to Statistics	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
<b>Total</b>		<b>16</b>	

<sup>†</sup>ERSC2101, CHEM2101, and PHYS2101 are key pre-requisite courses for Earth Sciences major.

Credits taken in excess of 16 can be counted as Major Electives (List G)

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

**LIST D: DEPARTMENTAL REQUIREMENTS (19 credits)**

<b>Code</b>	<b>Title</b>	<b>Credits</b>	<b>Pre-Requisite / Co-req. *</b>
ERSC2102	Introduction to Geology II	4	ERSC2101
ERSC3021	Structural Geology	3	ERSC2102 and LANC2058
ERSC3031	Geology of Oman	3	ERSC3041 and LANC2058
ERSC3041	Stratigraphy	3	ERSC2102 and LANC2058
ERSC4040	Geological Interpretation of Well-logs	3	ERSC3041
GEOP3041	General Geophysics	3	ERSC2101 and PHYS2101 and MATH2107 and LANC2058
<b>Total</b>		<b>19</b>	

**LIST E: DEPARTMENTAL ELECTIVES (6 credits)**

<b>Code</b>	<b>Title</b>	<b>Credits</b>	<b>Pre-Requisite / Co-req. *</b>
ERSC2112	Historical Geology	3	ERSC2101
ERSC3002	Environmental Site Assessment and Remediation	3	ERSC2102 and ERSC3000 and LANC2058
ERSC3071	GIS and Geo-Spatial Applications	3	ERSC2102 and LANC2058
ERSC3210	Palaeontology II	3	ERSC2211 and LANC2058
ERSC4032	Environmental Geochemistry	3	ERSC2101 and CHEM2101
ERSC4321	Structural Geology II	3	ERSC3021
ERSC5011	Basin Analysis	3	ERSC3021 and ERSC4311
ERSC5031	Tectonics	3	ERSC3021
ERSC5061	Exploration Geophysics	3	GEOP3041
ERSC5071	Image Processing and GIS	3	ERSC3061
ERSC5111	Microfacies	3	ERSC3901
ERSC5900	Advanced Diagenesis and Sedimentary Geochemistry	3	ERSC3901
ERSC5003	Geology Project I	3	ERSC4001
ERSC5004	Geology Project II	3	ERSC5003*
GEOP3042	Principles of Geophysical Well Logging	3	GEOP3041
<b>Total</b>		<b>6</b>	

Credits taken in excess of 6 can be counted as Major Electives (List G)

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

**LIST F: MAJOR REQUIREMENTS (45 credits)**

Code	Title	Credits	Pre-Requisite / Co-req. *
ERSC2211	Paleontology	3	ERSC2101 and LANC2058
ERSC3000	Environmental Geology	3	ERSC2101 and LANC2058
ERSC3010	Mineralogy	3	ERSC2102* and LANC2058
ERSC3051	Igneous Petrology	3	ERSC3010 and LANC2058
ERSC3061	Remote Sensing	3	ERSC2102 and LANC2058
ERSC3901	Sedimentary Petrology	3	ERSC2211 and ERSC3010
ERSC4000	Field Mapping Project	3	ERSC4001
ERSC4001	Field Mapping Techniques	3	ERSC3021 and ERSC3901
ERSC4012	Metamorphic Petrology	3	ERSC3051
ERSC4031	Geochemistry	3	ERSC2102 and CHEM2101
ERSC4051	Hydrogeology	3	ERSC3000
ERSC4071	Economic Geology	3	ERSC3051
ERSC4311	Sedimentary Environments and Facies	3	ERSC3901
ERSC5012	Techniques in Sequence Stratigraphy	3	ERSC4311
ERSC5051	Petroleum Geology	3	ERSC3041
<b>Total</b>		<b>45</b>	

**LIST G: MAJOR ELECTIVES (21 credits)**

Additional courses may periodically be added to this list (List G); courses in addition to those listed below which can be counted as Major Electives will be listed in the Department website.

Code	Title	Cr	Pre-req./Co-req.*
BIOL2102	General Biology II	4	BIOL2101
BIOL3005	Ecology	3	BIOL2102 and LANC2058
BIOL3009	Introduction to Environmental Science	3	BIOL2102 and LANC2058
BIOL3011	Plant Physiology	3	BIOL2102 and LANC2058
BIOL3023	Animal Physiology	4	BIOL2102 and LANC2058
BIOL3025	Invertebrates	3	BIOL2102 and LANC2058
BIOL3030	Population Genetics	3	BIOL2102 and LANC2058
BIOL3202	Molecular Biology	3	BIOL2101 and LANC2058
BIOL3410	Angiosperm Biology	3	BIOL2102 and LANC2058
BIOL3441	Introductory Microbiology	3	BIOL2101 and LANC2058
BIOL4000	Generic Skills for Biologists	3	BIOL2101
BIOL4009	Waste Management	3	BIOL3009
BIOL4021	Vertebrate Zoology	3	BIOL2102
BIOL4023	Entomology	3	BIOL2102
BIOL4030	Bacteriology	3	BIOL3441
BIOL4034	Biochemistry	3	BIOL2101 and CHEM3324
BIOL4041	Animal Histology	3	BIOL2102 or BIOL2105
BIOL4042	Parasitology	3	BIOL2102
BIOL4046	Fundamentals of Biotechnology	3	BIOL3202 and BIOL3441
BIOL4054	Marine Biology	3	BIOL3005
BIOL4432	Genetics	3	BIOL 2101
BIOL4500	Cell Biology	3	BIOL2101 or MEDI2108

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

Code	Title	Cr	Pre-req./Co-req.*
BIOL4501	Principles of Toxicology	3	BIOL2101
BIOL4600	Biofuels	3	BIOL3441 or BIOL4030
BIOL4640	Environmental Pollution	3	BIOL4009
BIOL4700	Environmental Biotechnology	3	BIOL3441
BIOL5010	Ecotoxicology	3	BIOL3009
BIOL5021	Desert Biology	3	BIOL3005
BIOL5031	Enzyme Biochemistry	3	BIOL4034
BIOL5040	Genetic Engineering	3	BIOL3202
BIOL5042	Embryology	3	BIOL2102
BIOL5045	Economy Botany	3	BIOL2102
BIOL5052	Freshwater Biology	3	BIOL3005
BIOL5110	Special Topics in Biology	3	Instructor
BIOL5120	Microbial Biotechnology	3	BIOL3441 and BIOL4046
BIOL5132	Tissue Culture	3	BIOL4500
BIOL5133	Plant biotechnology	3	BIOL4046
BIOL5144	Applied Mycology	3	BIOL3441
BIOL5244	Cytogenetics	3	BIOL4432
BIOL5400	Bio-Informatics	3	BIOL3202
BIOL5401	Environmental microbiology techniques	3	BIOL3009 and BIOL3201
BIOL5402	Immunology	3	BIOL3441 and BIOL4500
BIOL5411	Fermentation Technology	3	BIOL4030
BIOL5501	Protein Production and Characterization	3	BIOL4034 and BIOL4046
BIOL5600	Techniques in Molecular Diversity	3	BIOL3202
BIOL5610	Environmental Impact Assessment	3	BIOL3009
CHEM2102	General Chemistry II	4	CHEM2101 or CHEM1071
CHEM2350	Chemical Safety: Protecting ourselves and the environment	3	CHEM2101 or CHEM1071 or CHEM2110
CHEM3311	Inorganic Chemistry I	3	LANC2058 and CHEM2102 and MATH2107
CHEM3324	Organic Chemistry for Engineering	4	(LANC2058 or LANC2161) and (CHEM1071 or CHEM2101)
CHEM3328	Green Chemistry	3	LANC2058 and (CHEM3322 or CHEM3324)
CHEM3333	Physical Chemistry I	3	LANC2058 and CHEM2101 and PHYS2101 and MATH2107
CHEM3337	Fundamentals of the Corrosion of Metals	3	LANC2058 and (CHEM2101 or CHEM1071)
CHEM3348	Introduction to Chemical and Instrumental Analysis	3	CHEM2102
CHEM3350	Environmental Chemistry	3	LANC2058 and CHEM2102
CHEM3400	Introduction to Chemical Process Industries	3	LANC2058 and CHEM2101 and CHEM3333*
CHEM3420	Petroleum Chemistry	3	LANC2058 and (CHEM3322 or CHEM3324)
CHEM4412	Inorganic Materials	3	CHEM3311
CHEM4414	Fundamentals of X-ray Crystallography	3	CHEM3311
CHEM4424	Introduction to Natural Products	3	CHEM3324 or CHEM4422
CHEM4429	Fundamentals of Medicinal Chemistry and Drug Design	3	CHEM3324 or CHEM4422
CHEM4433	Physical Chemistry II	3	CHEM3333 and PHYS2102 and MATH2108
CHEM4437	Electrochemistry: Fundamentals and Applications	3	CHEM3333
CHEM4445	Forensic Chemistry	3	CHEM3341 or CHEM3348
CHEM4472	Fine Chemicals	3	CHEM3324 or CHEM4422
CHEM4477	Essentials of Biological Chemistry	3	CHEM3324 or CHEM4422
CHEM5526	Essentials of Heterocyclic Chemistry	2	CHEM3324 or CHEM4422
CHEM5537	Surfactants: Principles & Applications in the Petroleum Industry	3	CHEM3333 or CHPE3102

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

Code	Title	Cr	Pre-req./Co-req.*
CHEM5539	Chemical Sensors	3	CHEM3333 and (CHEM3348 or CHEM4441)
CHEM5591	Chemistry Seminar I	1	CHEM3322 or CHEM3324
COMP2102	Problem Solving and Programming	3	COMP2101
COMP2105	Introduction to Problem Solving with Visual Basic	3	COMP2101
COMP2200	Fundamentals of Object Oriented Programming	3	COMP2101
COMP3203	Introduction to Data Structures and Algorithms	3	COMP2200 and MATH3340 and LANC2058
COMP3204	Advanced Java Programming	3	COMP2200 and LANC2058
COMP3205	Database Systems	3	COMP3203 and LANC2058
COMP3302	Introduction to Multimedia	3	COMP2200 and LANC2058
COMP3401	Introduction to Software Engineering	4	COMP2200 and LANC2058
COMP3501	Computer Organization & Assembly Language	3	COMP2200 and ECCE3206 and LANC2058
COMP3502	Computer Networks	3	COMP3501 and LANC2058
COMP3600	Intelligent Systems	3	COMP3203 and LANC2058
COMP3601	Bioinformatics Algorithms	3	BIOL2101 and COMP2101
COMP3700	Introduction to Web Computing	3	COMP3203 and LANC2058 / COMP3205*
COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401
COMP4202	Database Development	3	COMP3205
COMP4204	Advanced Data Structures and Algorithms	3	COMP3203 and MATH3340
COMP4205	Competitive Programming	3	COMP3203
COMP4212	Introduction to Information Retrieval	3	COMP3203
COMP4300	Computer Graphics I	3	COMP3202 and MATH2202
COMP4402	Software Testing	3	COMP3401
COMP4404	Software Project Management	3	COMP3401
COMP4471	Computational Methods	3	COMP2200 and MATH2108 and MATH2202
COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501
COMP4504	Wireless Networks	3	COMP3502
COMP4506	Systems and Networks Programming	3	COMP4501 and COMP3502
COMP4603	Machine Learning	3	COMP3600 and STAT2103
COMP4604	Digital Image Processing	3	COMP3600
COMP4701	Web Application Development	3	COMP3700 and COMP3205
COMP4704	Mobile Application Development	3	COMP3700 and COMP3205
COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501
COMP5400	Software Architecture and Design	3	COMP3401
COMP5401	Requirement Engineering	3	COMP3401
COMP5504	Distributed Systems	3	COMP4506
COMP5507	Cryptography and Network Security	3	COMP3203 and COMP3502
COMP5508	Interconnection Networks for Multiprocessor and Multicore Systems	3	COMP3502
COMP5509	Penetration Testing and Ethical Hacking	3	COMP4507
COMP5511	Computer Forensics	3	COMP4507
COMP5521	Finite Automata & Formal Languages	3	MATH3340
COMP5522	Compiler Construction	3	COMP3501 and COMP5521
COMP5603	Computer Vision	3	COMP4603
COMP5605	Mobile Robotics	3	COMP3600 and MATH2108
COMP5701	Web Services	3	COMP4701
COMP5702	Web Data Mining and Knowledge Discovery	3	COMP4701 and STAT2103
COMP5704	Semantic Web	3	COMP4701



**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

Code	Title	Cr	Pre-req./Co-req.*
GEOP3000	Earthquakes and Society	3	ERSC2101 and LANC2058
GEOP4001	Applied Geophysics I	3	GEOP3041 and PHYS3100
GEOP4002	Applied Geophysics II	3	GEOP3041 and PHYS3103
GEOP4003	Gravity and Magnetic Exploration Methods	3	GEOP3041
GEOP4010	Fundamentals of Signal Processing	3	GEOP4001 and (MATH3171 or MATH3302)
GEOP4011	Geophysical Data Processing	3	GEOP4010 and MATH3171
GEOP5021	Engineering and Environmental Geophysics	3	GEOP3041
GEOP5060	Interpretation of Seismic Reflection Data	3	ERSC3041 and GEOP3041
LANC2146	Academic Writing in Science	3	LANC2140 or LANC2145 or LANC2058
MATH2108	Calculus II	3	MATH2107
MATH2202	Linear Algebra I	3	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)
MATH2350	Foundations of Mathematics	3	MATH2107
MATH3110	Calculus III	4	LANC2058 and MATH2108
MATH3302	Ordinary Differential Equations	3	LANC2058 and MATH2108
MATH3303	Linear Algebra II	3	LANC2058 and MATH2202
MATH3360	Discrete Mathematics	3	LANC2058 and MATH2350
MATH3573	Graph theory	3	LANC2058 and MATH3360
MATH3730	Computer Algebra system I	2	LANC2058 and MATH2202 and MATH3302
MATH3744	Introduction to Mathematical Modelling	3	LANC2058 and MATH3110 and MATH3302
MATH4141	Numerical Analysis	3	MATH2202 and MATH3302
MATH4450	Real Analysis I	3	MATH2108 and MATH2350
MATH4452	Introduction to Complex Variables	3	MATH3110 or MATH3171
MATH4453	Abstract Algebra I	3	MATH2202 and MATH2350
MATH4455	Abstract Algebra II	3	MATH4453
MATH4473	Linear Programming	3	MATH2202 or MATH3171
MATH4474	Introduction to Partial Differential Equations	3	MATH3302
MATH4481	Introduction to Optimization	3	MATH2108 and (MATH2202 or MATH3171)
MATH4552	Logic and Set Theory	3	MATH2350 or MATH3340
MATH4599	Introduction to Topology	3	MATH2350
MATH5451	Real Analysis II	3	MATH4450
MATH5470	Integral Transforms	3	MATH4474 and MATH4452*
MATH5551	Fluid Dynamics	3	MATH4474
MATH5553	Differential Geometry I	3	MATH3110 and MATH3303
MATH5558	Introduction to Number Theory	3	MATH2350 or MATH3340
PHYS2102	General Physics II	4	PHYS2101 / MATH2107*
PHYS2901	Introductory Astronomy	3	
PHYS3001	Dynamics	3	LANC2058 and PHYS2102 and PHYS3101
PHYS3101	Theoretical Methods of Physics I	3	LANC2058 and MATH2108 /MATH3171*
PHYS3103	Physics III	3	LANC2058 and PHYS2102 and MATH2107
PHYS3104	Modern Physics	3	LANC2058 and PHYS3103
PHYS3601	Radiation Physics	3	LANC2058 and PHYS3104
PHYS3602	Fundamentals of Radiation Protection	3	LANC2058 and PHYS3601

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
PHYS3603	Operational Radiation Protection	3	LANC2058 and PHYS3602
PHYS3901	Mysteries of the Universe	3	LANC2058 and (PHYS2801 or PHYS2901)
PHYS3903	Introduction to Space Science	3	LANC2058 and (PHYS2801 or PHYS2801)
PHYS3905	Essentials of Meteorology	3	LANC2058 and PHYS2102 and (PHYS2801 or PHYS2901)
PHYS3907	Observational Techniques in Astronomy	3	LANC2058 and PHYS3901
PHYS4018	Thermal & Statistical Physics	4	PHYS3104
PHYS4020	Electromagnetic Theory	3	PHYS3101 and PHYS3103 and MATH3171
PHYS4100	Optics & Lasers	3	PHYS4020
PHYS4101	Quantum Physics I	3	PHYS3101 and PHYS3104
PHYS4601	Ionizing Radiation Detection	3	PHYS3601
PHYS4602	Nuclear Applications	3	PHYS3601
PHYS4901	Stellar Evolution & Nucleosynthesis	3	PHYS3901
PHYS5003	Condensed Matter Physics	3	PHYS4018
PHYS5106	Nuclear Physics	3	PHYS4101
PHYS5601	Introduction to Nuclear Power	3	PHYS3601
PHYS5901	Image Processing & Data Analysis	3	PHYS3100 and PHYS3907
STAT2102	Introduction to Probability	3	STAT2101
STAT3331	Operations Research I	3	MATH2108 and LANC2058
STAT3334	Introduction to Inference	3	STAT2102 and LANC2058
STAT3335	Introduction to Sampling	3	STAT2102 and LANC2058
STAT3336	Computational Techniques in Statistics	3	STAT2102 and COMP2200 and LANC2058
STAT3337	Introduction to Actuarial Science I	3	STAT2102 and LANC2058
STAT3338	Statistical Methods	3	STAT3334 and LANC2058
STAT4422	Demographic and Health Care Statistics	3	STAT3334
STAT4432	Regression Analysis	3	STAT3334
STAT4433	Design of Experiments I	3	STAT3338
STAT4434	Non Parametric Statistics	3	STAT3334
STAT4436	Survey Design	3	STAT3335
STAT4533	Quality Assurance and Reliability	3	STAT2102
STAT5521	Categorical Data analysis	3	STAT3338

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

**LIST J & K: Minors offered to Earth Science Students**

Minor*	College	Page
Minor in Biology	Science	12
Minor in Chemistry	Science	13
Minor in Computer Science	Science	14
Minor in Physics	Science	15
Minor in Nuclear Science	Science	15
Minor in Astronomy	Science	15
Minor in Mathematics	Science	16
Minor in Statistics	Science	17
Minor in Business	Economics and Political Science	17
Minor in Soil and Water Sciences	Agricultural and Marine Sciences	18

\* Students are required to complete 18 Credits in the minor courses to qualify for a minor.

\* Courses counting towards an approved Minor may substitute courses listed as Major Electives (List G) but no more than 8 credits counting towards the Major degree (lists C, D, E, F) may count towards a Minor.

<b>Minor in BIOLOGY - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
Code	Title	Cr	Pre-req./Co-req.*
BIOL2101	General Biology I	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604
BIOL2102	General Biology II	4	BIOL2101
<b>K. Minor Electives</b>			
Code	Title	Cr	Pre-req./Co-req.*
BIOL3005	Ecology	3	BIOL2102 and LANC2058
BIOL3009	Introduction to Environmental Science	3	BIOL2102 and LANC2058
BIOL3011	Plant Physiology	3	BIOL2102 and LANC2058
BIOL3023	Animal Physiology	4	BIOL2102 and LANC2058
BIOL3025	Invertebrates	3	BIOL2102 and LANC2058
BIOL3202	Molecular Biology	3	BIOL2101 and LANC2058
BIOL3410	Angiosperm Biology	3	BIOL2102 and LANC2058
BIOL3441	Introductory Microbiology	3	BIOL2101 and LANC2058
BIOL4030	Bacteriology	3	BIOL3441
BIOL4034	Biochemistry	3	BIOL2101 and (CHEM3322 or CHEM3327)
BIOL4046	Fundamental Of Biotechnology	3	BIOL3202 and BIOL3441
BIOL4432	Introduction to Genetics	3	BIOL2101
BIOL4500	Cell Biology	3	BIOL2101 or MEDI2108
BIOL5021	Desert Biology	3	BIOL3005
BIOL5042	Embryology	3	BIOL2102
BIOL5052	Freshwater Biology	3	BIOL3005
BIOL5402	Immunology	3	BIOL3441 and BIOL4500

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in CHEMISTRY - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
CHEM2101	General Chemistry I	4	(FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0109)
CHEM2102	General Chemistry II	4	CHEM2101 or CHEM1071
CHEM3322 or CHEM3324	Organic Chemistry I or Organic Chemistry <i>for Engineering</i>	4 4	LANC2058 and CHEM2101 (LANC2058 or LANC2161) and (CHEM1071 or CHEM2101)
<b>K. Minor Electives</b>			
Any other courses in Chemistry excluding courses offered as University electives			
CHEM2350	Chemical Safety: Protecting ourselves and the environment	3	CHEM2101 or CHEM1071 or CHEM2110
CHEM3311	Inorganic Chemistry I	3	LANC2058 and CHEM2102 and MATH2107
CHEM3328	Green Chemistry	3	LANC2058 and (CHEM3322 or CHEM3324)
CHEM3333	Physical Chemistry I	3	LANC2058 and CHEM2101 and PHYS2101 and MATH2107
CHEM3337	Fundamentals of the Corrosion of Metals	3	LANC2058 and (CHEM2101 or CHEM1071)
CHEM3348	Introduction to Chemical and Instrumental Analysis	3	CHEM2102
CHEM3350	Environmental Chemistry	3	LANC2058 and CHEM2102
CHEM3400	Introduction to Chemical Process Industries	3	LANC2058 and CHEM2101 and CHEM3333*
CHEM3420	Petroleum Chemistry	3	LANC2058 and (CHEM3322 or CHEM3324)
CHEM4412	Inorganic Materials	3	CHEM3311
CHEM4414	Fundamentals of X-ray Crystallography	3	CHEM3311
CHEM4424	Introduction to Natural Products	3	CHEM3324 or CHEM4422
CHEM4429	Fundamentals of Medicinal Chemistry and Drug Design	3	CHEM3324 or CHEM4422
CHEM4433	Physical Chemistry II	3	CHEM3333 and PHYS2102 and MATH2108
CHEM4437	Electrochemistry: Fundamentals and Applications	3	CHEM3333
CHEM4445	Forensic Chemistry	3	CHEM3341 or CHEM3348
CHEM4472	Fine Chemicals	3	CHEM3324 or CHEM4422
CHEM4477	Essentials of Biological Chemistry	3	CHEM3324 or CHEM4422
CHEM5537	Surfactants: Principles & Applications in the Petroleum Industry	3	CHEM3333 or CHPE3102
CHEM5539	Chemical Sensors	3	CHEM3333 and (CHEM3348 or CHEM4441)

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in COMPUTER SCIENCE - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
COMP2101	Introduction to Computer Science	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604) and (FPCS0101 or PCS0102)
COMP2200	Fundamentals of Object Oriented Programming	3	COMP2101
<b>K. Minor Electives</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
COMP2102	Problem Solving and Programming	3	COMP2101
COMP2105	Introduction to Problem Solving with Visual Basic	3	COMP2101
COMP3203	Introduction to Data Structures and Algorithms	3	COMP2200 and MATH3340 and LANC2058
COMP3204	Advanced Java Programming	3	COMP2200 and LANC2058
COMP3205	Database Systems	3	COMP3203 and LANC2058
COMP3302	Introduction to Multimedia	3	COMP2200 and LANC2058
COMP3401	Introduction to Software Engineering	4	COMP2200 and LANC2058
COMP3501	Computer Organization & Assembly Language	3	COMP2200 and ECCE3206 and LANC2058
COMP3502	Computer Networks	3	COMP3501 and LANC2058
COMP3600	Intelligent Systems	3	COMP3203 and LANC2058
COMP3601	Bioinformatics Algorithms	3	BIOL2101 and COMP2101
COMP3700	Introduction to Web Computing	3	COMP3203 and LANC2058 / COMP3205*
COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401
COMP4202	Database Development	3	COMP3205
COMP4204	Advanced Data Structures and Algorithms	3	COMP3203 and MATH3340
COMP4205	Competitive Programming	3	COMP3203
COMP4212	Introduction to Information Retrieval	3	COMP3203
COMP4300	Computer Graphics I	3	COMP3202 and MATH2202
COMP4402	Software Testing	3	COMP3401
COMP4404	Software Project Management	3	COMP3401
COMP4471	Computational Methods	3	COMP2200 and MATH2108 and MATH2202
COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501
COMP4504	Wireless Networks	3	COMP3502
COMP4506	Systems and Networks Programming	3	COMP4501 and COMP3502
COMP4603	Machine Learning	3	COMP3600 and STAT2103
COMP4604	Digital Image Processing	3	COMP3600
COMP4701	Web Application Development	3	COMP3700 and COMP3205
COMP4704	Mobile Application Development	3	COMP3700 and COMP3205
COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501
COMP5400	Software Architecture and Design	3	COMP3401
COMP5401	Requirement Engineering	3	COMP3401
COMP5504	Distributed Systems	3	COMP4506
COMP5507	Cryptography and Network Security	3	COMP3203 and COMP3502
COMP5508	Interconnection Networks for Multiprocessor and Multicore Systems	3	COMP3502
COMP5509	Penetration Testing and Ethical Hacking	3	COMP4507
COMP5511	Computer Forensics	3	COMP4507
COMP5521	Finite Automata & Formal Languages	3	MATH3340
COMP5522	Compiler Construction	3	COMP3501 and COMP5521
COMP5603	Computer Vision	3	COMP4603
COMP5605	Mobile Robotics	3	COMP3600 and MATH2108
COMP5701	Web Services	3	COMP4701
COMP5702	Web Data Mining and Knowledge Discovery	3	COMP4701 and STAT2103
COMP5704	Semantic Web	3	COMP4701

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in PHYSICS - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
PHYS2101	General Physics I	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)
PHYS2102	General Physics II	4	PHYS2101 /MATH2017*
PHYS3103	Physics III	3	LANC2058 and PHYS2102 and MATH2107
PHYS3104	Modern Physics	3	LANC2058 and PHYS3103
<b>K. Minor Electives</b>			
Any other courses in Physics excluding courses offered as University electives			

<b>Minor in Nuclear Science - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
PHYS 3601	Radiation Physics	3	LANC2058 and PHYS3104
PHYS 3602	Fundamentals of Radiation Protection	3	LANC2058 and PHYS3601
PHYS 3603	Operational Radiation Protection	3	LANC2058 and PHYS3602
PHYS 4601	Ionizing Radiation Detection	3	PHYS 3601
PHYS4602	Nuclear Applications	3	PHYS 4601
PHYS 5601	Introduction to Nuclear Power	3	PHYS 3601

<b>Minor in ASTRONOMY - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
PHYS2901	Introductory Astronomy	3	
PHYS3901	Mysteries of the Universe	3	LANC2058 and (PHYS2801 or PHYS2901)
PHYS3903	Intro. To Space Science	3	LANC2058 and (PHYS2801 or PHYS2901)
PHYS3905	Essentials of Meteorology	3	LANC2058 and PHYS2102 and (PHYS2801 or PHYS2901)
PHYS3907	Observational Techniques in Astronomy	3	LANC2058 and PHYS3901
<b>K. Minor Electives</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
PHYS4901	Stellar Evolution & Nucleosynthesis	3	PHYS3901
PHYS4902	Galactic structure and Cosmology	3	PHYS3901
PHYS5901	Image Processing & Data Analysis	3	PHYS3100 and PHYS3907

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in MATHEMATICS - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
MATH 2107	Calculus I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
MATH 2108	Calculus II	3	MATH 2107
MATH 2202*	Linear Algebra I	3	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0109)
MATH 3110*	Calculus III	4	MATH 2108
*MATH3171	Linear Algebra & Multivariate Calculus for Engineers	3	MATH2108
MATH3171 can substitute for both (MATH2202 and MATH3110) above. However, students who have passed MATH3171 cannot take MATH2202 or MATH3110, and vice versa.			
<b>K. Minor Electives</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
MATH3302 or	Ordinary Differential Equations	3	MATH2108
MATH4174	Differential Equations & Applications for Engineers	3	MATH2108
MATH3303	Linear Algebra II	3	MATH2202
MATH2350 or	Foundations of Mathematics	3	MATH2107
MATH3340	Discrete Mathematics for Computer Science	3	MATH2107 and COMP2101
MATH3573	Graph Theory	3	MATH2350 or MATH3340
MATH3744	Introduction to Mathematical Modeling	3	MATH3110 and MATH3302
MATH4141	Numerical Analysis	3	MATH2108 and MATH2202
MATH4450	Real Analysis I	3	MATH2108 and (MATH2350 or MATH3340)
MATH4452	Introduction to Complex Variables	3	MATH3110 or MATH3171
MATH4453	Abstract Algebra I	3	MATH2202 and (MATH2350 or MATH3340)
MATH4473	Linear Programming		MATH2202 or MATH3171
MATH4474	Introduction to Partial Differential Equations	3	MATH3302
MATH4481	Introduction to Optimization	3	MATH2108 and
MATH5551	Fluid Dynamics	3	(MATH2202 or MATH3171)
MATH5558	Introduction to Number Theory	3	MATH4474

**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in STATISTICS - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
STAT2101	Introduction to Statistics	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 and FPMT0105 or FPMT0109
STAT2102	Introduction to Probability	3	STAT2101
STAT3334	Introduction to Inference	3	STAT2102 and LANC2058
<b>K. Minor Electives</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
STAT3331	Operations Research I	3	MATH2108 and LANC2058
STAT3335	Introduction to Sampling	3	STAT2102 and LANC2058
STAT3336	Computational Techniques in Statistics	3	STAT2102 and COMP2200 and LANC2058
STAT3338	Statistical Methods	3	STAT3334 and LANC2058
STAT4432	Regression Analysis	3	STAT3334
STAT4433	Design of Experiments I	3	STAT3338
STAT4434	Non Parametric Statistics	3	STAT3334
STAT4436	Survey Design	3	STAT3335
STAT4533	Quality Assurance and Reliability	3	STAT2102
STAT5521	Categorical Data analysis	3	STAT3338
STAT5536	Time Series Analysis	3	STAT4432
STAT5537	Multivariate Techniques	3	MATH2202 and MATH3110 and STAT3334

<b>Minor in Business - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
POMG2710	Operation Management	3	STAT1811 or equivalent (STAT1001)
POMG3711	Principles of Management Science	3	STAT1811 or equivalent (STAT1001)
ECON1211	Microeconomics	3	
ECON2221	Macroeconomics	3	
MRKT3611	Principles of Marketing	3	ECON1211 (NREC3104) and ECON2221 (NREC3103)
MNGT1515	Principles of Management	3	
ACCT1112	Introduction to Financial Accounting	3	
ACCT1112			
PHYS5901	Image Processing & Data Analysis	3	PHYS3100 and PHYS3907



**Department of Earth Sciences - Earth Sciences Study Plan for Cohorts 2016-2020**

<b>Minor in SOIL AND WATER SCIENCES - complete successfully 18 Credits from the following:</b>			
<b>J. Minor Requirements</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
SWAE2201	Introduction to Soil and Water	3	FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604)
<b>K. Minor Electives</b>			
<b>Code</b>	<b>Title</b>	<b>Cr</b>	<b>Pre-req./Co-req.*</b>
SWAE3002	Desertification and Land Restoration	3	SWAE2201
SWAE3302	Environmental Soil Chemistry	3	CHEM2101 and SWAE2201
SWAE3304	Soil and Water Conservation	3	PHYS2101 and (SWAE2001 or SWAE2201)
SWAE3311	Environmental Soil Physics	3	PHYS2101 and (SWAE2001 or SWAE2201)
SWAE3411	Environmental Soil Microbiology	3	BIOL2101
SWAE4111	Hydrogeology for Soil-Water-Landscape Interactions	3	SWAE2201 and SWAE3303 and SWAE3311 and CR*
SWAE4401	Water and Nutrients in Soil-Plant Environments	3	SWAE2201 and CR*

\* CR - CAMS college requirement courses which are B10L2101, CAMS2000, CAMS2003, CAMS3000, CAMS3001, CHEM2101, PHYS2101 or PHYS2107.

For reference contact:

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Ext. 6833

Approved by Dean of Science:

Prof. Salma Al Kindy

Date: 1 / 12 / 2016

Office of Admissions & Registration:

Confirmed:



