Degree and Study Plan

College:	Science
Department:	Computer Science
Cohorts:	2021-2025
Degree:	Bachelor of Science[1]
Major:	Computer Science
Specializations:	1- Intelligent Systems and Data Science
	2- Cybersecurity and Computing Infrastructure
	3- Web and Software Development

[1] Accredited by the Computing Accreditation Commission of ABET, **http://www.abet.org**

Summary of Credits:		
University Requirements (UR)		**6**
Foundation Program	NC[+]	
Arabic	2	
Oman: State and People	2	
Oman and Islamic Civilization or Islamic Culture	2	
University Electives (UE)		**6**
See List A		
College Requirements (CR)		**3**
See list B		
College Electives (CE)		**16**
See list C		
Departmental Requirements (DR)		**12**
See list D		
Departmental Electives (DE)		**0**
See list E		
Major Requirements (AR)		**42**
See list F		
Major Electives (AE)		**9**
See list G		
Specialization Requirements (SR)[++]		**22**
See list H		
Specialization Electives (SE)[++]		**6**
See list I		
Minor Requirements (MR)[+++]		**0**
See list J		
Minor Electives (ME) [+++]		**0**
See list K		
TOTAL		**122**

[+] Not credited.

[++] Specialization is optional: If no specialization, the student must take one of the final year project courses (COMP5900, COMP5490, COMP5590, or COMP5690) and the remaining 24 credits can be used for minor and/or major electives.

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

For reference contact: **Prof. Khaled Day** Ext. **2231**

HOD: **Dr. Abdullah Al-Hamdani** Date: 15 December 2022

Dean's Office: **Dr. Talal Al-Hosni** Date: 18 Dec 2022

Admission and Registration: Date: _____

COLLEGE OF SCIENCE DEAN'S OFFICE SULTAN QABOOS UNIVERSITY

Study Plan for Cohorts 2021-2025

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 1 Fall	ARAB1001 or ARAB1019	Arabic Arabic for Non-Arabic Speakers (3 Cr)	2		UR
	COMP2101	Introduction to Computer Science	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPCS0101 or FPCS0102)	CE
	LANC2058	Communication in Science	3	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604	CR
	MATH2107	Calculus I	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0108 or FPMT0109)	CE
	SOCY1005 or SOCY1007*	Oman: State and People Omani Contemporary Society	2		UR
	Total		**15**		

*For non-Omani citizens only

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 2 Spring	COMP2202	Fundamentals of Object Oriented Programming	3	COMP2101	DR
	ECCE3206	Digital Logic Design	3		AR
	MATH3340	Discrete Mathematics for Computer Science	3	MATH2107 and COMP2101 and LANC2058	AR
	STAT2101	Introduction to Statistics	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0108 or FPMT0109)	CE
		University Elective 1	2		UE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 3 Fall	COMP3203	Introduction to Data Structures & Algorithms	3	COMP2202 and MATH3340 and LANC2058	DR
	COMP3700	Introduction to Web Computing	3	COMP2202 and LANC2058	AR
	COMP3501	Computer Organization & Assembly Language	3	COMP2101 and ECCE3206 and LANC2058	AR
	MATH2201	Linear Algebra I	3	FPMT0105 or FPMT0108 or FPMT0109	AR
	STAT2102	Introduction to Probability	3	STAT2101 and (MATH2108 or MATH2109)*	AR
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 4 Spring	COMP3205	Database Systems	3	COMP3203 and LANC2058	AR
	COMP3502	Computer Networks	3	COMP3203	AR
	COMP3600	Intelligent Systems	3	(COMP3203 or COMP3603) and LANC2058	AR
	COMP3401	Introduction to Software Engineering	4	COMP3203	AR
		Major Elective 1	3		AE
	Total		**16**		

Study Plan for Cohorts 2021-2025
INTELLIGENT SYSTEMS AND DATA SCIENCE SPECIALIZATION

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 5 Fall	COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401	DR
	COMP4204	Advanced Data Structures and Alg.	3	COMP3203	AR
	COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501	AR
	COMP4603	Machine Learning	3	(COMP3203 or COMP3603) and (MATH2202 or MATH2201)	SR
	HIST1010 or ISLM1010	Oman & Islamic Civilization or Islamic Culture	2		UR
	MATH2108 or MATH2109	Calculus II	3	MATH2107	AR
	Total		**16**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 6 Spring	COMP4509	Introduction to Computer Security	3	COMP3502 and COMP4501	AR
	COMP4605	Computer Vision	3	COMP4603	SR
	COMP4609	Deep Learning Fundamentals	3	COMP4603	SR
		College Elective	4		CE
		University Elective 2	2		UE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Summer	COMP4445	Summer Training	0	COMP4100	AR
	Total		**0**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 7 Fall	COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501	AR
	COMP5602	Pattern Recognition & Analysis	3	COMP4605	SR
	COMP5605	Mobile Robotics	3	COMP3600	SR
		Specialization Elective 1	3		SE
		Major Elective 2	3		AE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 8 Spring	COMP5606	Natural Language Processing	3	COMP3600	SR
	COMP5690	Project in Intelligent Systems and Data Science	4	COMP4100 + 3 courses from the Intelligent Systems and Data Science Specialization Requirements	SR
		Specialization Elective 2	3		SE
		Major Elective 3	3		AE
		University Elective 3	2		UE
	Total		**15**		

Study Plan for Cohorts 2021-2025
CYBERSECURITY AND COMPUTING INFRASTRUCTURE SPECIALIZATION

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 5 Fall	COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401	DR
	COMP4204	Advanced Data Structures and Alg.	3	COMP3203	AR
	COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501	AR
	COMP4515	Mobile Networks	3	COMP3502	SR
	HIST1010 or ISLM1010	Oman & Islamic Civilization or Islamic Culture	2		UR
	MATH2108 or MATH2109	Calculus II	3	MATH2107	AR
	Total		**16**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 6 Spring	COMP4506	Systems and Networks Programming	3	COMP3502 and COMP4501	SR
	COMP4509	Introduction to Computer Security	3	COMP3502, COMP4501	AR
		Major Elective 2	3		AE
		College Elective	4		CE
		University Elective 2	2		UE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Summer	COMP4445	Summer Training	0	COMP4100	AR
	Total		**0**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 7 Fall	COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501	AR
	COMP5504	Distributed Systems	3	COMP4506	SR
	COMP5507	Cryptography and Network Security	3	COMP3202 and COMP3502	SR
		Specialization Elective 1	3		SE
		Major Elective 3	3		AE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 8 Spring	COMP5509	Penetration Testing and Ethical Hacking	3	COMP4509	SR
	COMP5511	Computer Forensics	3	COMP4509	SR
	COMP5590	Project in Cybersecurity and Computing Infrastructure	4	COMP4100 + 3 courses from the Cybersecurity and Computing Infrastructure Specialization Requirements	SR
		Specialization Elective 2	3		SE
		University Elective 3	2		UE
	Total		**15**		

Study Plan for Cohorts 2021-2025
WEB AND SOFTWARE DEVELOPMENT SPECIALIZATION

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 5 Fall	COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401	DR
	COMP4204	Advanced Data Structures and Alg.	3	COMP3203	AR
	COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501	AR
	COMP4701	Web Application Development	3	COMP3205 and COMP3700	SR
	HIST1010 or ISLM1010	Oman & Islamic Civilization or Islamic Culture	2		UR
	MATH2108 or MATH2109	Calculus II	3	MATH2107	AR
	Total		**16**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 6 Spring	COMP4206	Mobile Applications Development	3	COMP3203	SR
	COMP4402	Software Testing	3	COMP3401	SR
	COMP4509	Introduction to Computer Security	3	COMP3502, COMP4501	AR
		College Elective	4		CE
		University Elective 2	2		UE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Summer	COMP4445	Summer Training	0	COMP4100	AR
	Total		**0**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 7 Fall	COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501	AR
	COMP5402	Requirements Engineering	3	COMP3401	SR
	COMP5701	Web Services	3	COMP4701	SR
		Specialization Elective 1	3		SE
		Major Elective 2	3		AE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 8 Spring	COMP5405	Software Patterns	3	COMP3401	SR
	COMP5490	Project in Web and Software Development	4	COMP4100 + 3 courses from the Web and Software Development Specialization Requirements	SR
		Specialization Elective 2	3		SE
		Major Elective 3	3		AE
		University Elective 3	2		UE
	Total		**15**		

Study Plan for Cohorts 2021-2025
GENERAL COMPUTER SCIENCE - NO SPECIALIZATION

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 5 Fall	COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401	DR
	COMP4204	Advanced Data Structures and Alg.	3	COMP3203	AR
	COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501	AR
	HIST1010 or ISLM1010	Oman & Islamic Civilization or Islamic Culture	2		UR
	MATH2108 or MATH2109	Calculus II	3	MATH2107	AR
		Major Elective 2	3		AE
	Total		**16**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 6 Spring	COMP4509	Introduction to Computer Security	3	COMP3502, COMP4501	AR
		Major Elective 3	3		AE
		Major Elective 4	3		AE
		College Elective	4		CE
		University Elective 2	2		UE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Summer	COMP4445	Summer Training	0	COMP4100	AR
	Total		**0**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 7 Fall	COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501	AR
		Major Elective 5	3		AE
		Major Elective 6	3		AE
		Major Elective 7	3		AE
		Major Elective 8	3		AE
	Total		**15**		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 8 Spring	COMP5900	Project in Computer Science	4	COMP4100	AR
		Major Elective 9	3		AE
		Major Elective 10	3		AE
		Major Elective 11	3		AE
		University Elective 3	2		UE
	Total		**15**		

Department of Computer Science

BSc in Computer Science Degree Plan for Cohorts 2021-2025

DEGREE PLAN :122 CREDITS

UNIVERSITY REQUIREMENTS (6 CREDITS)

Course code	Cr	Course Title	Prerequisites (Co-Requisite)
ARAB1060 or ARAB1019	2	Arabic Arabic for Non-Arabic Speakers (3 Cr)	
HIST1010 or ISLM1010	2	Oman & Islamic Civilization or Islamic Culture	
SOCY1005 or SOCY1007*	2	Oman: State and People Omani Contemporary Society	

*For non-Omani citizens only

LIST A: UNIVERSITY ELECTIVES (6 CREDITS)

See SQU Deanship of Admission and Registration website for the list of University Electives
Available at: https://sis.squ.edu.om/sis/webreg/3s/electiveTimeTable.jsp

LIST B: COLLEGE REQUIRMENTS (3 CREDITS)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
LANC2058	Communication in Science	3	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604
Total		**3**	

LIST C: COLLEGE ELECTIVES (16 CREDITS)

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

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL2101	General Biology 1	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604
CHEM2101	General Chemistry 1	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT 0105 or FPMT0109)
COMP2101†	Introduction to Computer Science	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPCS0101 or FPCS0102)
ERSC2101	Introduction to Geology	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604
MATH2107†	Calculus I	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0108 or FPMT0109)
PHYS2101	General Physics I	4	(FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT 0105 or FPMT0109)
STAT2101†	Introduction to Statistics	4	(FPE0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or FPMT0108 or PMT0109)

† COMP2101, MATH2107, and STAT2101 are key Pre-Requisite courses for Computer Science Major Requirements.

LIST D: DEPARTMENTAL REQUIREMENTS (12 CREDITS)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
COMP2202	Fundamentals of Object Oriented Programming	3	COMP2101
COMP3203	Introduction to Data Structures and Algorithms	3	COMP2202 and MATH3340 and LANC2058
COMP3401	Introduction to Software Engineering	4	COMP3203
COMP4100	Ethics and Skills for Computing Professionals	2	COMP3401
Total		**12**	

LIST F: MAJOR REQUIREMENTS (42 CREDITS)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
Computer Science: 30 credits			
COMP3205	Database Systems	3	COMP3203 and LANC2058
COMP3501	Computer Organization & Assembly Language	3	COMP2101 and ECCE3206 and LANC2058
COMP3502	Computer Networks	3	COMP3203
COMP3600	Intelligent Systems	3	(COMP3203 or COMP3603) and LANC2058
COMP3700	Introduction to Web Computing	3	COMP2202 and LANC2058
COMP4204	Advanced Data Structures and Algorithms	3	COMP3203
COMP4445	Summer Training	0	COMP4100
COMP4501	Fundamentals of Operating Systems	3	COMP3203 and COMP3501
COMP4509	Introduction to Computer Security	3	COMP3502, COMP4501
COMP5101	Comparative Programming Languages	3	COMP3203 and COMP3501
ECCE3206	Digital Logic Design	3	
Math: 12 credits			
MATH2108 or MATH2109	Calculus II	3	MATH2107
MATH2201	Linear Algebra I	3	FPMT0105 or FPMT0108 or FPMT0109
MATH3340	Discrete Mathematics for Computer Science	3	MATH2107 and COMP2101 and LANC2058
STAT2102	Introduction to Probability	3	STAT2101 and (MATH2108 or MATH2109)*
Total		**42**	

LIST G: MAJOR ELECTIVES
(9 CREDITS IF SPECIALIZATION, 33 CREDITS IF NO SPECIALIZATION)

Student must take at least 2 credits from a natural science course that includes laboratory work. Possible choices include BIOL2101, BIOL2102, BIOL2600, CHEM2101, CHEM2102, CHEM3324, ERSC2101, ERSC2102, ERSC2211, ERSC3000, ERSC3016, PHYS2101, PHYS2102, if not used for College Electives (List C).

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL2102	General Biology II	4	
BIOL2600	Biodiversity	3	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
BIOL3700	Communication and Knowledge Management in Science	3	BIOL2900
BIOL4000	Generic Skills for Biologists	3	BIOL2101
BIOL4009	Waste Management	3	BIOL3009
BIOL4010	Sustainability And 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	BIOL3202
BIOL4500	Cell Biology	3	BIOL2101
BIOL4501	Principles of Toxicology	3	BIOL2101
BIOL4600	Biofuels	3	BIOL3441
BIOL4601	Occupational Health, Safety and Environment	2	BIOL3009
BIOL4640	Environmental Pollution	3	BIOL4009
BIOL4700	Environmental Biotechnology	3	BIOL3441
BIOL5010	Ecotoxicology	3	BIOL3009
BIOL5021	Desert Biology	3	BIOL3005/BIOL5052*
BIOL5031	Enzyme Biochemistry	3	BIOL4034

BIOL5034	Plant Metabolites	3	BIOL4034
BIOL5040	Genetic Engineering	3	BIOL3202
BIOL5042	Embryology	3	BIOL2102
BIOL5045	Economic Botany	3	BIOL2102
BIOL5052	Freshwater Biology	3	BIOL3005/BIOL5021*
BIOL5054	Biological Conservation	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	Bioinformatics	3	BIOL3202
BIOL5401	Environmental microbiology techniques	3	BIOL3009, BIOL3201
BIOL5402	Immunology	3	BIOL4500
BIOL5411	Fermentation Technology	3	BIOL4030
BIOL5433	Bioprocess Technology	3	BIOL4030 and BIOL5120
BIOL5501	Protein Production and Characterization	3	BIOL4034, 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	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
CHEM3395	Science and Society	2	Any two of the following: BIOL2101 CHEM2101 ERSC2101 MATH2107 PHYS2101
CHEM3400	Introduction to Chemical Process Industries	3	LANC2058 and CHEM2101 and CHEM3333*
CHEM3420	Petroleum Chemistry	3	LANC2058 and (CHEM3322 or CHEM3324)
CHEM4411	Inorganic Chemistry II	3	CHEM3311
CHEM4412	Inorganic Materials	3	CHEM3311
CHEM4413	Organometallic Chemistry	3	CHEM4411
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	CHEM3324or CHEM4422
CHEM4433	Physical Chemistry II	3	CHEM3333 and MATH2108

CHEM4437	Electrochemistry: Fundamentals and Applications	3	CHEM3333
CHEM4445	Forensic Chemistry	3	CHEM3341 or CHEM3348
CHEM4472	Fine Chemicals	3	CHEM3324 or CHEM4422
CHEM4476	Catalysis	3	CHEM4411
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
CHEM5538	Chemical Kinetics	3	CHEM4433
CHEM5539	Chemical Sensors	3	CHEM3333 and (CHEM3348 or CHEM4441)
CHEM5546	Surface Chemistry and Surface Analysis	3	(CHEM3341 or CHEM3348) and (CHEM3333 or CHPE3102)
CHEM5591	Chemistry Seminar I	1	CHEM3322 or CHEM3324
COMP5591	Internship in Computer Science I	0	COMP4100 and (80-100 credit hours)
COMP5592	Internship in Computer Science II	6	COMP5591
ERSC2102	Introduction to Geology II	4	ERSC2101
ERSC2112	Historical Geology	3	ERSC2101
ERSC2211	Paleontology	3	ERSC2101 and LANC2058
ERSC3000	Environmental Geology	3	ERSC2101 and LANC2058
ERSC3002	Environmental Site Assessment and Remediation	3	ERSC2102 and ERSC3000 and LANC2058
ERSC3010	Mineralogy	3	ERSC2102 and LANC2058
ERSC3016	Remote Sensing & GIS	3	ERSC2101 and LANC2058
ERSC3021	Structural Geology	3	ERSC2102 and LANC2058
ERSC3041	Stratigraphy	3	ERSC2102 and LANC2058
ERSC3061	Remote Sensing	3	ERSC3016
ERSC3071	GIS and Geo-Spatial Applications	3	ERSC3016
ERSC3210	Palaeontology II	3	ERSC2211 and LANC2058
ERSC3901	Sedimentary Petrology	3	ERSC2211 and ERSC3010
ERSC3903	Igneous & Metamorphic Petrology	3	ERSC3010
ERSC4031	Geochemistry	3	ERSC2102 and CHEM2101
ERSC4032	Environmental Geochemistry	3	ERSC2101 and CHEM2101
ERSC4051	Hydrogeology	3	ERSC3000
ERSC4071	Economic Geology	3	ERSC3051
ERSC4171	Mining Geology	3	ERSC3903
ERSC4311	Sedimentary Environments and Facies	3	ERSC3901
ERSC4321	Structural Geology II	3	ERSC3021
ERSC5011	Basin Analysis	3	ERSC3021 and ERSC4311
ERSC5012	Techniques in Sequence Stratigraphy	3	ERSC4311
ERSC5031	Tectonics	3	ERSC3021
ERSC5042	Engineering Geology	3	ERSC3021
ERSC5051	Petroleum Geology	3	ERSC3041
GEOP3041	General Geophysics	3	ERSC2101 and PHYS2101 and MATH2107 and LANC2058

GEOP3142	Interpretation of Well-logs	3	GEOP3041
GEOP4000	Fundamentals of Signal Processing	3	GEOP3041 and PHYS3100
GEOP4001	Applied Geophysics I: Seismic Methods	3	GEOP3041 and PHYS3100
GEOP4002	Applied Geophysics II: Electrical/Electromagnetic	3	GEOP3041 and PHYS3103
GEOP4003	Gravity & Magnetic Exploration Methods	3	GEOP3041
GEOP4004	Exploration geophysics	3	GEOP3041
GEOP4011	Geophysical Data Processing	3	GEOP4001 and MATH3171
LANC2146	Academic Writing in Science	3	LANC2058
MATH2348	Foundations of Math	4	MATH2107
MATH3111	Calculus III	3	MATH2108 or MATH2109
MATH3302	Ordinary Differential Equations	3	LANC2058 and (MATH2108 or MATH2109)
MATH3303	Linear Algebra II	3	MATH2202 or MATH2201
MATH3573	Graph Theory	3	LANC2058 and MATH3360
MATH3730	Computer Algebra System I	3	LANC2058 and (MATH2202 or MATH2201) and MATH3302 and (MATH3111 or MATH3110 or MATH3171)
MATH3744	Introduction to Mathematical Modeling	3	LANC2058 and (MATH3111 or MATH3110 or MATH3171) and MATH3302
MATH4141	Numerical Analysis	3	(MATH2202 or MATH2201) and MATH3302
MATH4451	Real Analysis		MATH2351
MATH4452	Introduction to Complex Variables	3	MATH3111 or MATH3110 or MATH3171
MATH4453	Abstract Algebra I	3	(MATH2202 or MATH2201) and (MATH2348 or MATH2350)
MATH4473	Linear Programming	3	MATH2202 or MATH2201 or MATH3171
MATH4474	Introduction to PDEs		MATH3302
MATH4481	Introduction to Optimization	3	(MATH2108 or MATH2109) and (MATH2202 or MATH2201 or MATH3171)
MATH4552	Logic and Set Theory	3	MATH2348 or MATH2350
MATH4599	Introduction to Topology	3	MATH2348 or MATH2350
MATH5470	Integral Transforms	3	MATH4474 and MATH4452*
MATH5551	Fluid Dynamics	3	MATH4474
MATH5553	Differential Geometry	3	(MATH3111 or MATH3110) and MATH3303
MATH5558	Introduction to Number Theory	3	MATH2348 or MATH2350
PHYS2102	General Physics II	4	PHYS2101 /MATH2107*
PHYS2401	Introduction to Nanoscience and its Applications	3	LANC2058
PHYS2910	From the Big Bang to Black Holes	3	
PHYS3001	Dynamics	3	LANC2058 and PHYS2102 and PHYS3101
PHYS3005	Experimental Methods of Physics I	3	LANC2058 and PHYS2102
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
PHYS3106	Electronics	4	LANC2058 and PHYS2102
PHYS3110	Computational Physics I	2	LANC2058 and COMP2101 and MATH2107and PHYS2102 /MATH3171*
PHYS3120	Physics of the Atmosphere	2	PHYS3103 and LANC2058

PHYS3601	Radiation Physics	3	LANC2058 and PHYS3104
PHYS3602	Fundamentals of Radiation Protection	3	LANC2058 and PHYS3601
PHYS3603	Operational Radiation Protection	3	LANC2058 and PHYS3602
PHYS3903	Introduction to Space Science	3	LANC2058 and PHYS2910
PHYS3905	Essentials of Meteorology	3	LANC2058 and PHYS2102 and PHYS2910
PHYS3907	Observational Techniques in Astronomy	3	LANC2058 and PHYS3910
PHYS3910	Fundamental Astronomy	3	LANC2058 and PHYS2910
PHYS4018	Thermal & Statistical Physics	4	PHYS3104
PHYS4030	Electromagnetic Theory	3	PHYS3101 and PHYS3103 and MATH3171
PHYS4100	Optics & Lasers	3	PHYS4030
PHYS4101	Quantum Physics I	3	PHYS3101 and PHYS3104
PHYS4105	Experimental Methods of Physics II	3	PHYS3005
PHYS4110	Computational Physics II	3	PHYS3001and PHYS3100 and PHYS4101
PHYS4601	Ionizing Radiation Detection	3	PHYS3601
PHYS4602	Nuclear Applications	3	PHYS4601
PHYS5601	Introduction to Nuclear Power	3	PHYS3601
PHYS4901	Stellar Evolution & Nucleosynthesis	3	PHYS3910
PHYS4902	Galactic Structure and Cosmology	3	PHYS3910
PHYS5003	Condensed Matter Physics I	3	PHYS4018
PHYS5105	Experimental Methods of Physics III	3	PHYS3106 and PHYS4105 / PHYS4100* and PHYS5003*
PHYS5106	Nuclear Physics	3	PHYS4101
PHYS5901	Image Processing and Data Analysis	3	PHYS3100 and PHYS3907
STAT3331	Operations Research I	3	MATH2108 & STAT2101 & LANC2058
STAT3333	Demographic and Health Care Statistics	3	STAT2102 & MATH2107
STAT3334	Introduction to Inference	3	STAT2102 & LANC2058
STAT3335	Introduction to Sampling	3	STA2102 & LANC2058
STAT3336	Computational Techniques	3	STAT3334 & COMP2101 & LANC2058
STAT3339	Statistical Inference	3	STAT3334
STAT4432	Regression Analysis	3	(MATH2202 or MATH2201) & STAT3339
STAT4433	Design and Analysis of Experiments I	3	STAT3339
STAT4434	Non-parametric Statistics	3	STAT3339, MATH2108
STAT4436	Survey Methodology	3	STAT3335
STAT4533	Statistical Quality Control	3	STAT2102
STAT4534	Simulation and Modeling	3	STAT3336, STAT3339
STAT4535	Survival Analysis	3	STAT3334
STAT5521	Categorical Data Analysis	3	STAT3336, STAT3339
STAT5536	Time Series Analysis	3	STAT4432
STAT5537	Multivariate Techniques	3	(MATH2202 or MATH2201) + MATH3111+ STAT3336, STAT4433
STAT5539	Data Analysis	3	STAT3336 & STAT 4432 & STAT4433 & STAT4434/STAT5521*

LIST H: SPECIALIZATION REQUIREMENTS (22 CREDITS)

Select one of the sub-lists H1, H2 or H3
Credits in excess of 22 (from other specializations) can be counted as Specialization Electives (List I)

LIST H1: INTELLIGENT SYSTEMS AND DATA SCIENCE SPECIALIZATION

Code	Title	Credits	Pre-Requisite / Co-Requisite*
COMP4603	Machine Learning	3	(COMP3203 or COMP3603) and (MATH2202 or MATH2201)
COMP4605	Computer Vision	3	COMP4603
COMP4609	Deep Learning Fundamentals	3	COMP4603
COMP5602	Pattern Recognition and Analysis	3	COMP4605
COMP5605	Mobile Robotics	3	COMP3600
COMP5606	Natural Language Processing	3	COMP3600
COMP5690	Project in Intelligent Systems and Data Science	4	COMP4100 + 3 courses from the Intelligent Systems and Data Science Specialization Requirements
Total		**22**	

LIST H2: CYBERSECURITY AND COMPUTING INFRASTRUCTURE SPECIALIZATION

Code	Title	Credits	Pre-Requisite / Co-Requisite*
COMP4506	Systems and Networks Programming	3	COMP3502 and COMP4501
COMP4515	Mobile Networks	3	COMP3502
COMP5504	Distributed Systems	3	COMP4506
COMP5507	Cryptography and Network Security	3	COMP3203 and COMP3502
COMP5509	Penetration Testing and Ethical Hacking	3	COMP4509
COMP5511	Computer Forensics	3	COMP4509
COMP5590	Project in Cybersecurity and Computing Infrastructure	4	COMP4100 + 3 courses from the Cybersecurity and Computing Infrastructure Specialization Requirements
Total		**22**	

LIST H3: WEB AND SOFTWARE DEVELOPMENT SPECIALIZATION

Code	Title	Credits	Pre-Requisite / Co-Requisite*
COMP4206	Mobile Applications Development	3	COMP3203
COMP4402	Software Testing	3	COMP3401
COMP4701	Web Application Development	3	COMP3205 and COMP3700
COMP5402	Requirements Engineering	3	COMP3401
COMP5405	Software Patterns	3	COMP3401
COMP5701	Web Services	3	COMP4701
COMP5490	Project in Web and Software Development	4	COMP4100 + 3 courses from the Web and Software Development Specialization Requirements
Total		**22**	

LIST I: SPECIALIZATION ELECTIVES (6 CREDITS)

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

Code	Title	Credits	Pre-Requisite / Co-Requisite*
COMP2102	Problem Solving and Programming	3	COMP2101
COMP2105	Introduction to Problem Solving with Visual Basic	3	COMP2101
COMP2206	Introduction to Java	3	COMP2202
COMP2607	Computing in Industry 4.0	3	
COMP3204	Advanced Java Programming	3	COMP2202 and LANC2058
COMP3302	Introduction to Multimedia	3	COMP2202 and LANC2058
COMP3601	Bioinformatics Algorithms	3	BIOL2101, COMP2101
COMP3602	Data Analysis and Visualization with Python	3	COMP2101
COMP3603	Programming Foundation for Machine Learning	3	COMP2101
COMP4202	Database Development	3	COMP3205
COMP4205	Competitive Programming	3	COMP3203
COMP4212	Introduction to Information Retrieval	3	COMP3203
COMP4300	Computer Graphics I	3	COMP3203 and (MATH2202 or MATH2201)
COMP4404	Software Project Management	3	COMP3401
COMP4471	Computational Methods	3	COMP2101 and (MATH2108 or MATH2109) and (MATH2202 or MATH2201)
COMP4507	Internetworking with TCP/IP	3	COMP3502
COMP4604	Digital Image Processing	3	COMP3600
COMP4606	Applied Data Science	3	COMP4603
COMP5204	Computer Science Special Topics (1)	3	Instructor Consent
COMP5400	Software Architecture and Design	3	COMP3401
COMP5508	Interconnection Networks for Multiprocessor and Multicore Systems	3	COMP3502
COMP5557	High Performance Computing	3	COMP3502 and COMP4501
COMP5521	Finite Automata & Formal Languages	3	MATH3340
COMP5522	Compiler Construction	3	COMP3501 and COMP5521
COMP5702	Semantic Web	3	COMP4701
COMP5704	Web Data Mining and Knowledge Discovery	3	COMP4701 and STAT2102
Total		**6**	

LISTS J & K: MINOR REQUIRMENTS AND ELECTIVES (18 CREDITS)

List of Minors offered for Computer Science Students

LISTS J & K	Minor*	College
1	Minor in Astronomy	Science
2	Minor in Biotechnology	Science
3	Minor in Business	Economics and Political Science
4	Minor in Chemistry	Science
5	Minor in Earth Science	Science
6	Minor in Environmental Biology	Science
7	Minor in Mathematics	Science
8	Minor in Nuclear Science	Science
9	Minor in Physics	Science
10	Minor in Soil and Water Sciences	Agricultural and Marine Sciences
11	Minor in Statistics	Science

* Minor is optional. Students are required to complete 18 credits of the minor required and elective 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.

1. MINOR IN ASTRONOMY
DEPARTMENT OF PHYSICS

J1. Minor in Astronomy: Required Courses (0 Credits)

K1. Minor in Astronomy: Elective Courses (Minimum 18 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
PHYS2910	From the Big Bang to Black Holes	3	
PHYS3910	Fundamental Astronomy	3	LANC2058 and (PHYS2910 or PHYS2801 or PHYS2901)
PHYS3903	Introduction to Space Science	3	LANC2058 and PHYS2102 and (PHYS2801 or PHYS2901)
PHYS3905	Essentials of Meteorology	3	LANC2058 and PHYS3901
PHYS3907	Observational Techniques in Astronomy	3	PHYS3901
PHYS4901	Stellar Evolution and Nucleosynthesis	3	PHYS3901
PHYS4902	Galactic Structure and Cosmology	3	PHYS3100 and PHYS3907
PHYS5901	Image Processing and Data Analysis	3	LANC2058 and (PHYS2801 or PHYS2901)
Total (minimum)		**18**	

2. MINOR IN BIOTECHNOLOGY
DEPARTMENT OF BIOLOGY

J2. Minor in Biotechnology: Required Courses (7 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL2101	General Biology I	4	FPEL 0560 or FPEL0600 or FPEL0603 or FPEL0604
BIOL3202	Molecular Biology	3	BIOL2101 and LANC2058
Total		**7**	

K2. Minor in Biotechnology: Elective Courses (11 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL3441	Introductory Microbiology	3	BIOL2101 and LANC2058
BIOL4030	Bacteriology	3	BIOL3441
BIOL4034	Biochemistry	3	BIOL2101 and CHEM3322
BIOL4046	Fundamentals of Biotechnology	3	BIOL3202
BIOL4500	Cell Biology	3	BIOL2101
BIOL4600	Biofuels	3	BIOL4030
BIOL4700	Environmental Biotechnology	3	BIOL3441
BIOL5120	Microbial Biotechnology	3	BIOL4046 and BIOL3441
BIOL5133	Plant Biotechnology	3	BIOL4046
BIOL5400	Bioinformatics	3	BIOL3202
BIOL5433	Bioprocess Technology	3	BIOL4030 and BIOL5120
Total (minimum)		**11**	

3. MINOR IN BUSINESS
COLLEGE OF ECONOMICS AND POLITICAL SCIENCE

J3. Minor in Business: Required Courses (0 Credits)

K3. Minor in Business: Elective Courses (18 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
ACCT1112	Introductory to Finance Accounting	3	
ECON1211	Microeconomics	3	
ECON2221	Macroeconomics	3	
MNGT1515	Principles of Management	3	
MRKT3611	Principles of Marketing	3	ECON1211 and ECON2221
POMG2710	Operation Management	3	STAT1811 or STAT2101
POMG3711	Principles of Management Science	3	STAT1811 or STAT2101
Total		**18**	

4. MINOR IN CHEMISTRY
DEPARTMENT OF CHEMISTRY

J4. Minor in Chemistry: Required Courses (12 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
CHEM2101	General Chemistry I	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)
CHEM2102	General Chemistry II	4	CHEM2101 or CHEM1071
CHEM3322 or CHEM3324	Organic Chemistry I or Organic Chemistry	4 or 4	LANC2058 and CHEM2101 (LANC2058 or LANC2161) and (CHEM1071 or CHEM2101)
Total		**12**	

K4. Minor in Chemistry: Elective Courses (6 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
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 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 and Applications in the Petroleum Industry	3	CHEM3333 or CHPE3102
CHEM5539	Chemical Sensors	3	CHEM3333 and (CHEM3348 or CHEM4441)
Total		**6**	

5. MINOR IN EARTH SCIENCES
DEPARTMENT OF EARTH SCIENCES

J5. Minor in Earth Sciences: Required Courses (8 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
ERSC2101	Introduction to Geology I	4	FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604
ERSC2102	Introduction to Geology II	4	ERSC2101
Total		**8**	

K5. Minor in Earth Sciences: Elective Courses (Minimum 10 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
ERSC2211	Paleontology I	3	ERSC2101 and LANC2058
ERSC3000	Environmental Geology	3	ERSC2101 and LANC2058
ERSC3002	Environmental Site Assessment and Remediation	3	ERSC2102 and ERSC3000 and LANC2058
ERSC3010	Mineralogy	3	ERSC2102* and LANC2058
ERSC3021	Structural Geology	3	ERSC2102 and LANC2058
ERSC3016	Remote Sensing & GIS	3	ERSC2101 and LANC2058
ERSC3041	Stratigraphy	3	ERSC2102 and LANC2058
ERSC3051	Igneous Petrology	3	ERSC3010 and LANC2058
ERSC3061	Introduction to Remote Sensing	3	ERSC2102 and LANC2058
ERSC3071	GIS and Geo-Spatial Applications	3	ERSC2102 and LANC2058
ERSC3210	Paleontology II	3	ERSC2211 and LANC2058
ERSC3901	Sedimentary Petrology	3	ERSC2211 and ERSC3010
ERSC3903	Igneous & Metamorphic Petrology	3	ERSC3010 and LANC2058
ERSC4012	Metamorphic Petrology	3	ERSC3051
ERSC4031	Geochemistry	3	ERSC2102 and CHEM2101
ERSC4032	Environmental Geochemistry	3	ERSC2101 and CHEM2101
ERSC4040	Geological Interpretation of Well-logs	3	ERSC3041
ERSC4051	Hydrogeology	3	ERSC3000
ERSC4071	Economic Geology	3	ERSC3051
ERSC4171	Mining Geology	3	ERSC3903
ERSC4311	Sedimentary Environments and Facies	3	ERSC3901
ERSC4321	Structural Geology II	3	ERSC3021
ERSC4903	Advanced Rock Analytics	3	ERSC3903
ERSC5011	Basin Analysis	3	ERSC3021 and ERSC4311
ERSC5012	Techniques in Sequence Stratigraphy	3	ERSC4311
ERSC5031	Tectonics	3	ERSC3021
ERSC5051	Petroleum Geology	3	ERSC3041
ESRC5061	Exploration Geophysics	3	GEOP3041
ERSC5111	Microfacies	3	ERSC3901
ERSC5900	Advanced Diagenesis and Sedimentary Geochemistry	3	ERSC3901
GEOP3041	General Geophysics	3	ERSC2101 and PHYS2101 and MATH2107 and LANC2058
GEOP3142	Interpretation of Well-logs	3	GEOP3041
GEOP4004	Exploration geophysics	3	GEOP3041
Total (minimum)		**10**	

6. MINOR IN ENVIRONMENTAL BIOLOGY
DEPARTMENT OF BIOLOGY

J6. Minor in Environmental Biology: Required Courses (8 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL2101	General Biology I	4	FPEL 0560 or FPEL0600 or FPEL0603 or FPEL0604
BIOL2102	General Biology II	4	BIOL2101
Total		**8**	

K6. Minor in Environmental Biology: Elective Courses (10 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
BIOL2600	Biodiversity	3	BIOL2101 and LANC2058
BIOL3005	Ecology	3	BIOL2102 and LANC2058
BIOL3205	Invertebrates	3	BIOL2102 and LANC2058
BIOL3009	Introduction to Environmental Science	3	BIOL2102 and LANC2058
BIOL3410	Angiosperm Biology	3	BIOL2102 and LANC2058
BIOL4010	Sustainability and Waste Management	3	BIOL3009
BIOL4021	Vertebrate Zoology	3	BIOL2102
BIOL4054	Marine Biology	3	BIOL3005
BIOL4900	Advanced Data Analysis for Biologists	3	BIOL2900
BIOL5010	Ecotoxicology	3	BIOL3009
BIOL5021	Desert Biology	3	BIOL3005
BIOL5052	Freshwater Biology	3	BIOL3005
BIOL5054	Conservation Biology	3	BIOL4900
BIOL5610	Environmental Impact Assessment	3	BIOL3005
Total (minimum)		**10**	

7. MINOR IN MATHEMATICS
DEPARTMENT OF MATHEMATICS

J7. Minor in Mathematics: Required Courses (16 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
MATH2107	Calculus I	4	(FPE0560 or FPEL0600 or FPEL0603 or FPEL0604) and (FPMT0105 OR FPMT0108 or PMT0109)
MATH2108 or MATH2109	Calculus Il Calculus II for Science and Engineering	3 or 3	 MATH2107
MATH2202 or MATH2201	Linear Algebra I Linear Algebra with Applications	3 or 3	(MATH2348 or MATH2350) and LANC2058 or (FPMT0108 or PMT0109) and LANC2058
MATH3110 or MATH3111 or MATH3171	Calculus III Calculus III Linear Algebra and Multivariate Calculus for Engineers	4 or 3 or 3	MATH2108 and LANC2058 (MATH2108 or MATH2109) and LANC2058 (MATH2108 or MATH2109) and LANC2058
Total		**13/14**	

*MATH3171 can substitute for both (MATH2202 or MATH2201) and (MATH3110 or MATH3111) above. However, students who have passed MATH3171 cannot take MATH2202 or MATH2201 or MATH3110 or MATH3111 and vice versa.

K7. Minor in Mathematics Electives (Minimum 4 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
MATH3302 or MATH4174	Ordinary Differential Equations Differential Equations & Applications for Engineers	3 3	MATH2108 or MATH2109 and LANC2058 MATH2108 or MATH2109 and LANC2058
MATH3303	Linear Algebra II	3	MATH2202 or MATH2201 and LANC2058
MATH2348 or MATH3340	Foundations of Mathematics Discrete Mathematics for Computer Science	4 3	MATH2107 and COMP2101 and LANC2058 COMP2101, COMP2002, LANC2058, MATH2107, LANC2051
MATH3573	Graph Theory	3	MATH2350 or MATH2348 or MATH3340 and LANC2058
MATH3744	Introduction to Mathematical Modeling	3	MATH3110 or MATH3111 and MATH3302 and LANC2058
MATH4141	Numerical Analysis	3	MATH2108 or MATH2109 and MATH 2202
MATH2351	Advanced Calculus	3	MATH2350 or MATH2348
MATH4450	Real Analysis I	3	MATH2108 or MATH2109 or MATH3340
MATH4451	Real Analysis	3	MATH2351
MATH4452	Introduction to Complex Variables	3	MATH3110 or MATH3111 or MATH3171
MATH4453	Abstract Algebra I	3	MATH2202 or MATH2201 and (MATH2350 or MATH2348 or MATH3340
MATH4473	Linear Programming	3	MATH2202 or MATH2201 or MATH3171

MATH4474	Introduction to Partial Differential Equations	3	MATH3302
MATH4481	Introduction to Optimization	3	MATH2202 or MATH2201 or MATH3171
MATH5551	Fluid Dynamics	3	MATH4474
MATH5558	Introduction to Number Theory	3	MATH2350 or MATH2348 or MATH3340
Total (minimum)		**4**	

8. MINOR IN NUCLEAR SCIENCE
DEPARTMENT OF PHYSICS

J8. Minor in Nuclear Science: Required Courses (18 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
PHYS3601	Radiation Physics	3	LANC2058 and PHYS3104
PHYS3602	Fundamentals of Radiation Protection	3	LANC2058 and PHYS3601
PHYS3603	Operational Radiation Protection	3	LANC2058 and PHYS3602
PHYS4601	Ionizing Radiation Detection	3	PHYS3601
PHYS4602	Nuclear Applications	3	PHYS4601
PHYS5601	Introduction to Nuclear Power	3	PHYS3601
PHYS3601	Radiation Physics	3	LANC2058 and PHYS3104
Total		**18**	

K8. Minor in Nuclear Science: Elective Courses (0 Credits)

9. MINOR IN PHYSICS
DEPARTMENT OF PHYSICS

J9. Minor in Physics: Required Courses (14 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
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
PHYS3103	Physics III	3	LANC2058 and PHYS2102 and MATH2107
PHYS3104	Modern Physics	3	LANC2058 and PHYS3103
Total		**14**	

K9. Minor in Physics: Elective Courses (Minimum 4 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
Any other courses in Physics*		4	
Total		**4**	

*Excluding Physics courses offered as University Electives.

10. MINOR IN SOIL AND WATER SCIENCES
COLLEGE OF AGRICULTURAL AND MARINE SCIENCES (CAMS)
(DEPARTMENT OF SOIL, WATER AND AGRICULTURAL ENGINEERING)

J10. Minor in Soil and Water Sciences: Required Courses (7 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
SWAE2201	Introduction to Soils and Water	3	FPEL 0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604
Total		**3**	

K10. Minor in Soil and Water Sciences: Elective Courses (15 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
SWAE3002	Desertification and Land Restoration	3	SWAE2201
SWAE3302	Environmental Soil Chemistry	3	SWAE2201 or CHEM2101
SWAE3304	Soil and Water Conservation	3	
SWAE3311	Environmental Soil Physics	3	SWAE2201 and PHYS2101 and (MATH2106 or FPMT0105 or FPMT0108 or FPMT0109)
SWAE3411	Environmental Soil Microscopy	3	BIOL2101
SWAE4111	Hydrology for Soil-Water Landscape Interactions	3	SWAE2201 and SWAE3303 and SWAE3311
SWAE4401	Water and Nutrients in Soil-Plant Environment	3	SWAE2201 and CR*
SWAE4404	Soil Genesis and Classification		(SWAE2201 or ERSC2101) and CR*
SWAE4412	Management of Salt-Affected Soil	3	SWAE2201 and CR*
Total		**15**	

*CR are CAMS requirement courses which are BIOL2101, CAMS2000, CAMS2003, CAMS3000, CAMS3001, CHME2101, PHYS2101 or PHYS2107.

11. MINOR IN STATISTICS
DEPARTMENT OF STATISTICS

J11. Minor in Statistics: Required Courses (10 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
STAT2101	Introduction to Statistics	4	(FPE0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or PMT0109)
STAT2102	Introduction to Probability	3	STAT2101 and (MATH2108 or MATH2109)*
STAT3334	Introduction to Inference	3	STAT2102 and LANC2058
Total		**10**	

K11. Minor in Statistics: Electives (Minimum 8 Credits)

Code	Title	Credits	Pre-Requisite / Co-Requisite*
STAT3335	Introduction to Sampling	3	STAT2102 and LANC2058
STAT3336	Computational Techniques in Statistics	3	STAT3334 and COMP2101
STAT3339	Statistical Inference	3	STAT3334
STAT4432	Regression Analysis	3	STAT3339 and (MATH2202 or MATH2201)
STAT4433	Design and Analysis of Experiments	3	STAT3339
STAT4434	Nonparametric Statistics	3	STAT3339 and MATH2108
STAT4437	Survey Methodology	3	STAT3335
STAT5521	Categorical Data Analysis	3	STAT3339 and STAT3336
STAT5536	Time Series Analysis	3	STAT4432
STAT5537	Multivariate Techniques	3	STAT3336 and STAT4433 and (MATH2202 or MATH2201) and MATH3111
Total		**8**	

For reference contact: **Prof. Khaled Day** Ext. 2231

Approved by Dean of Science: **Dr. Talal Al-Hosni** Date: 18-12-2022

Office of Admissions & Registration: _____

Confirmed: _____ Date: _____