

MINOR in science program

AM

Minor in APPLIED MATHEMATICS: for 618xxxx-628xxxx	
To minor in Applied Mathematics, students need to complete one course in Major Elective and the following nine courses	
Required courses: 32 credits	Credit
IC xx (<i>see AM major elective course list</i>)	4 (x-x-x)
ICMA 106 Calculus I	4 (4-0-8)
ICMA 151 Statistics for Science I	4 (4-0-8)
ICMA 213 Calculus II	4 (4-0-8)
ICMA 214 Ordinary Differential Equations	4 (4-0-8)
ICMA 216 Calculus IIIA	2 (2-0-4)
ICMA 217 Calculus IIIB	2 (2-0-4)
ICMA 223 Linear Algebra A	2 (2-0-4)
ICMA 224 Linear Algebra B	2 (2-0-4)
ICMA 322 Advanced Calculus	4 (4-0-8)

AM

Minor in APPLIED MATHEMATICS: for ≥638xxxx	
To minor in applied mathematics, students need to complete the following 20 credits applied mathematics courses in addition to or included in their existing requirement(s) for their respective major(s), minor(s) or certificate(s).	
Applied Mathematics Minor Courses 20 credits	Credit
ICMA 151 Statistics for Science I	4 (4-0-8)
ICMA 214 Ordinary Differential Equations*	4 (4-0-8)
ICMA 216 Calculus IIIA**	2 (2-0-4)
ICMA 217 Calculus IIIB*	2 (2-0-4)
ICMA 223 Linear Algebra A**	2 (2-0-4)
ICMA 224 Linear Algebra B*	2 (2-0-4)
ICMA 322 Advanced Calculus*	4 (4-0-8)
Decision Making Minor Courses 20 credits	Credit
ICMA 356 Decision Analysis	4 (4-0-8)
ICMB 201 Business Statistics	4 (4-0-8)
or	
ICMA 151 Statistics for Science I	4 (4-0-8)
ICIC 355 Judgement and Decision Making	4 (4-0-8)
ICIC 336 Behavioral Economics	4 (4-0-8)
ICBE 481 Game Theory for Business	4 (4-0-8)
Statistics Minor Courses 20 credits	Credit
ICCS 161 Introduction to Data Science	4 (3-2-7)

ICMA 253 Statistics for Science II	4 4-0-8)
ICMA 344 Time Series Analysis	4 4-0-8)
ICMA 432 Multivariate Analysis	4 4-0-8)
ICMA 435 Regression Analysis	4 4-0-8)

* For Computer Science students, ICMA214, ICMA217, ICMA224, and ICMA322 can be counted as Minor in Applied Mathematics if students did not take these courses as their major elective courses.

** For Computer Engineering and Computer Science students, ICMA216 and ICMA223 can be counted as Minor in Applied Mathematics if students did not take these courses as their major required courses.

If the courses in * & ** are the major required and major elective courses in the BA and Science programs and students in these programs have already taken these courses as their major required or major elective courses, students need to select one of the following courses in order to fulfill 20 credits of Minor in Applied Mathematics.

ICMA 222 Introduction to Mathematical Software	4 (4-0-8)
ICMA 242 Discrete Mathematics	4 (4-0-8)
ICMA 253 Statistics for Science II	4 (4-0-8)
ICMA 323 Partial Differential Equations	4 (4-0-8)
ICMA 335 Complex Variables	4 (4-0-8)
ICMA 338 Numerical Methods	4 (4-0-8)
ICMA 346 Optimization	4 (4-0-8)
ICMA 350 Probability	4 (4-0-8)
ICMA 424 Abstract Algebra	4 (4-0-8)

Minor in BIOLOGICAL SCIENCES: for 618xxxx - 628xxxx

To minor in Biological Sciences, students need to complete 10 credits of the Required courses and 18 credits of the Elective courses.
Sixteen (16) credits are permitted to overlap with the Major courses.

Required courses: 10 credits	Credit
ICBI 101 Biology	4 (4-0-8)
ICBI 102 Integrated Laboratory in Biological Sciences I	2 (0-4-2)
ICBI 103 Biology II	4 (4-0-8)
Elective courses: 18 credits	Credit
Biological Sciences and ICBI 498 Research and Seminar in Biological Sciences. The following ICBI 2xx courses can also be counted toward elective courses.	
ICBI 207 Ethics for Bioscience	4 (4-0-8)
ICBI 211 Genetics and Molecular Biology I	4 (4-0-8)
ICBI 214 General Microbiology	4 (4-0-8)
ICBI 271 General Microbiology Laboratory	2 (0-4-2)
ICBI 215 General Biochemistry	4 (4-0-8)
ICBI 272 General Biochemistry Laboratory	2 (0-4-2)
ICBI 216 Cell Biology	4 (4-0-8)
ICBI 221 Animal Biology	4 (3-2-7)
ICBI 231 Plant Biology	4 (3-2-7)
ICBI 262 Practical Field Ecology and Conservation	4 (3-2-7)

Minor in BIOLOGICAL SCIENCES: for ≥638xxxx

Minor in Biological Sciences 20 credits	Credit
Students must complete 4 credits from ICBI 121 Biology I, and 16 credits from any ICBI courses from the Major Core and Major Required lists. Note I: Some Major Core and Major Required courses may have a prerequisite, which students are required to complete before taking the corresponding Major Core and Major Required courses. Note II: Students should seek an approval from the Program Director for their Minor course list. Note III: Students who have completed A-level, AP, IB or equivalent qualification for Biology can be exempted from taking ICBI 121 Biology I, but still need to complete 20 credits from the Major Core and Major Required lists.	
Minor in Bioinformatics 20 credits	Credit
To minor in Bioinformatics, students need to take at least 5 courses from the below list.	
ICBI 325 Special Topics in Bioinformatics and Molecular Genetics	4 (4-0-8)
ICCS 101 Introduction to Computer Programming	4 (3-2-7)
ICCS 161 Introduction to Data Science	4 (3-2-7)
ICCS 204 Data Structure and Object-Oriented Programming	4 (3-2-7)
ICCS 205 Numerical Computation	4 (4-0-8)
ICCS 206 Discrete Mathematics	4 (4-0-8)
ICCS 312 Algorithms and Tractability	4 (4-0-8)
ICCS 361 Data Mining	4 (4-0-8)
ICCS 461 Machine Learning	4 (4-0-8)

Minor in CHEMISTRY: for 618xxxx - 628xxxx

To minor in Chemistry, students must complete 18 credits of required courses and 8 credits of elective courses as detailed below.

Chemistry Minor Courses: 26 credits	Credit
ICCH 210 General Chemistry I	4 (4-0-8)
ICCH 211 General Chemistry II	4 (4-0-8)
ICCH 224 Integrated Laboratory Techniques in Chemistry I	2 (0-4-2)
ICCH 221 Organic chemistry I	4 (4-0-8)
ICCH 222 Organic chemistry II	4 (4-0-8)

Minor in Chemistry for non-chemistry students: for ≥638xxxx

Chemistry Minor 20 credits	Credit
To minor in Chemistry, students need to complete at least 20 credits chemistry courses in addition to their existing requirement(s) for their respective major(s), minor(s) or certificate(s). The following courses are compulsory for all chemistry minor students.	
ICCH 101 General Chemistry I	4 (4-0-8)
ICCH 102 General Chemistry II	4 (4-0-8)
ICCH 103 Integrated Laboratory Techniques in Chemistry I	2 (0-4-2)
Provided that prerequisites are fulfilled, the following courses are recommended for chemistry minor students.	
ICCH 200 Analytical Chemistry A	4 (3-2-7)
ICCH 201 Analytical Chemistry B	4 (4-0-8)
ICCH 202 Organic Spectroscopy	4 (4-0-8)
ICCH 203 Inorganic Chemistry A	4 (4-0-8)
ICCH 204 Inorganic Chemistry B	4 (4-0-8)
ICCH 205 Inorganic Chemistry Laboratory	2 (0-4-2)
ICCH 206 Physical Chemistry A	4 (4-0-8)
ICCH 207 Physical Chemistry B	4 (4-0-8)
ICCH 208 Physical Chemistry Laboratory	2 (0-4-2)
ICCH 209 Polymer Science and Technology	2 (2-0-4)
ICCH 221 Organic Chemistry I	4 (4-0-8)
ICCH 222 Organic Chemistry II	4 (4-0-8)
ICCH 223 Organic Chemistry Laboratory	2 (0-4-2)
ICCH 225 Biochemistry	4 (4-0-8)
ICCH 226 Biochemistry Laboratory	2 (0-4-2)
ICCH 401 Chemical Unknown Detective	2 (0-4-2)
ICCH 340 Current Topics in Chemistry A	4 (4-0-8)
ICCH 345 Special Topics in Chemistry A	2 (2-0-4)
ICCH 350 Contemporary Topics in Chemistry A	1 (1-0-2)
ICCH 355 Special Practice in Chemistry A	1 (0-2-1)
ICCH 402 Undergraduate Thesis	6(0-12-6)

ICCH 403 Field Study A	1 (0-3-1)
education chemistry courses (ICGN xxx) cannot be counted towards a minor in chemistry.	

CS

Minor in COMPUTER SCIENCE: for 618xxxx - 628xxxx	
To minor in Computer Science, students must complete 16 credits of required courses and 12 credits of elective courses as detailed below.	
Required courses: 16 credits	Credit
ICCS 101 Introduction to Computer Programming	4(3-2-7)
ICCS 161 Introduction to Data Science	4(3-2-7)
ICCS 204 Data Structures and Object-Oriented Programming	4(3-2-7)
ICCS 206 Discrete Mathematics	4 (4-0-8)
Elective courses: 12 credits	Credit
<i>Minor Elective Courses</i>	
<i>Students can take any of the ICCS 3xx and 4xx courses to fulfill the elective requirement, except cooperative education courses (ICCS</i>	
ICCS 205 Numerical Computation	4 (4-0-8)
ICCS 225 Database Foundations	4 (4-0-8)
ICCS 227 Principles of Computer Systems and Architecture	4 (4-0-8)
ICCS 271 Interaction Design	4 (4-0-8)

Minor in COMPUTER SCIENCE: for ≥638xxxx	
The computer science program offers the following minors to students majoring in another degree program: Computer Science, Applied Data Science, and Web/Mobile Developer. To obtain a minor, the students must complete 5 courses as specified.	
Computer Science Minor	Credit
ICCS 101 Introduction to Computer Programming	4(3-2-7)
ICCS 206 Discrete Mathematics	4 (4-0-8)
ICCS 208 Data Structures and Abstractions	4(3-2-7)
ICCS xxx Any Computer Science course with code 200 and up	4 (x-x-x)
ICCS xxx Any Computer Science course with code 200 and up	4 (x-x-x)
Applied Data Science Minor	Credit
ICCS 101 Introduction to Computer Programming	4(3-2-7)
ICCS 206 Discrete Mathematics	4 (4-0-8)
ICCS 208 Data Structures and Abstractions	4(3-2-7)
ICCS 261 Principles of Data Science	4(3-2-7)
ICCS 361 Data Mining	4 (4-0-8)
Web/Mobile Developer Minor	Credit
ICCS 101 Introduction to Computer Programming	4(3-2-7)
ICCS 206 Discrete Mathematics	4 (4-0-8)
ICCS 208 Data Structures and Abstractions	4(3-2-7)
ICCS 370 Software System Construction	4 (4-0-8)
ICCS 340 Web Application Development	4 (4-0-8)

or	4 (4-0-8)
ICCS 448 Mobile Application Programming	4 (4-0-8)

EN

Minor in ENVIRONMENTAL SCIENCE: for 618xxxx - 628xxxx			
To minor in Environmental Science, students need to take these following courses no less than 20 credits.			
Required courses: 16 credits			Credit
ICBI 101 Biology			4 (4-0-8)
ICEN 212 Ecological Systems Analysis			4 (4-0-8)
ICEN 361 Principles of Environmental Impact Assessment			4 (4-0-8)
ICEN 391 Sustainable Development			4 (4-0-8)
Elective courses: 16 credits			
ICEN 211 Fundamentals and Applications of Environme	4 (3-2-7)	ICEN 413 Environmental Remediation Technology	4 (4-0-8)
ICEN 241 Environmental Pollution I	4 (4-0-8)	ICEN 414 Waste Utilization	4 (4-0-8)
ICEN 301 Basic Environmental Statistics	4 (4-0-8)	ICEN 415 Biodiversity	4 (4-0-8)
ICEN 312 Environmental Toxicology	4 (4-0-8)	ICEN 416 Ecotoxicology	4 (4-0-8)
ICEN 313 Waste Minimization and Clean Technology	4 (4-0-8)	ICEN 421 Water and Wastewater Treatment	4 (4-0-8)
ICEN 314 Tropical Ecology	4 (3-2-7)	ICEN 422 Solid and Hazardous Wastes Management	4 (4-0-8)
ICEN 317 Aquatic Ecology	4 (0-8-4)	ICEN 431 Land Use and Urban Environmental Planning	4 (4-0-8)
ICEN 318 Aquatic Ecology Field Course	4 (0-8-4)	ICEN 432 Global Geomorphology	4 (4-0-8)
ICEN 319 Conservation Biology	4 (4-0-8)	ICEN 441 Occupational Health and Safety	4 (4-0-8)
ICEN 320 Population and Community Ecology	4 (3-2-7)	ICEN 460 Ecotourism	4 (2-4-6)
ICEN 331 Soil, Land Use and Degradation	4 (4-0-8)	ICEN 461 Energy Conservation and Development	4 (4-0-8)
ICEN 332 Introduction to Oceanography	4 (3-2-7)	ICEN 462 Coastal and Marine Resources	4 (4-0-8)
ICEN 352 Environmental and Resource Economics	4 (4-0-8)	ICEN 464 Water Resources Management	4 (4-0-8)
ICEN 341 Environmental Quality Analysis I	4 (2-4-6)	ICEN 465 Resource Inventory and Baseline Studies Meth	4 (3-2-7)
ICEN 362 Natural Resource Conservation and Managem	4 (4-0-8)	ICEN 466 Environmental Management Systems	4 (4-0-8)
ICEN 392 Environmental Issues: Past, Present and Futur	4 (4-0-8)	ICEN 467 Environmental Risk Assessment and Managem	4 (4-0-8)
ICEN 401 Applied Mathematics for Environment Studies	4 (4-0-8)	ICEN 468 Environmental Management Policy	4 (4-0-8)
ICEN 402 Geoinformatics	4 (3-2-7)	ICEN 469 Heritage Conservation	4 (2-4-6)
ICEN 403 Principle of Environmental Informatics	4 (4-0-8)	ICEN 483 Physical Planning and Environment	4 (4-0-8)
ICEN 411 Climate Change and Its Impact	4 (4-0-8)	ICEN 484 Climate Change Mitigation and Adaptation to	4 (4-0-8)

NO Minor in ENVIRONMENTAL SCIENCE: for ≥638xxxx

FS

Minor in FOOD SCIENCE AND TECHNOLOGY: for 618xxxx - 628xxxx	
Food Science Minor: 32 credits	
- To minor in Food Science, students need to complete 32 credits of Food Science major courses.	
- Out of those 32 credits, 12 must come from the Required Major Courses specified below. The other 20 credits may be combination of any Food Science Major Required and Major Elective courses.	
- A maximum of 8 credits may overlap with the students' Major courses.	
The 12 credits of the Required Major courses compose of the followings.	
ICFS 111 Introduction to Food Science and Technology	4 (3-2-7)
ICFS 317 Food Chemistry	4 (3-2-7)
ICFS 341 Food Processing	4 (3-2-7)

FS

Minor in FOOD SCIENCE AND TECHNOLOGY: for ≥638xxxx	
Food Innovation and Design Minor: 20 credits	
To minor in Food Innovation and Design, students except Food Science major need to	
ICMB 222 Principle of Marketing	4 (4-0-8)
ICFS 345 Food Product and Process Design	4 (4-0-8)
ICFS 365 Food Safety and Sanitation Management	4 (4-0-8)
ICFS 366 Consultancy and Auditing in Food Quality and Safety Management	4 (4-0-8)
ICFS 439 Food Product Innovation	4 (4-0-8)

Minor in PHYSICS: for 618xxxx - 628xxxx			
To minor in Biological Sciences, students need to complete at least 32 credits			
Required courses: 24 credits			Credit
ICPY 101 Physics I			4 (4-0-8)
ICPY 102 Physics II			4 (4-0-8)
ICPY 321 Intermediate Mechanics			4 (4-0-8)
ICPY 322 Electricity and Magnetism			4 (4-0-8)
ICMA 106 Calculus I			4 (4-0-8)
ICPY 231 Mathematical Methods for Physics IA			2 (2-0-4)
ICPY 232 Mathematical Methods for Physics IB			2 (2-0-4)
Elective courses: 8 credits			
ICPY 200 Modern Physics	4 (4-0-8)	ICPY 455 Special Topics in Physics III	4 (4-0-8)
ICPY 221 Computer Programming for Physics	4 (4-0-8)	ICPY 456 Special Topics in Physics IV	4 (4-0-8)
ICPY 233 Mathematical Methods for Physics IIA	2 (2-0-4)	ICPY 457 Special Topics in Laboratory Physics II	4 (3-2-7)
ICPY 234 Mathematical Methods for Physics IIB	2 (2-0-4)	ICPY 461 Quantum Mechanics II	4 (4-0-8)
ICPY 323 Electrodynamics	4 (4-0-8)	ICPY 463 Quantum Mechanics III	4 (4-0-8)
ICPY 324 Wave and Optics	4 (4-0-8)	ICPY 471 Atomic and Molecular Physics	4 (4-0-8)
ICPY 333 Mathematical Methods for Physics III	4 (4-0-8)	ICPY 472 Solid State Physics	4 (4-0-8)
ICPY 334 Numerical Methods	4 (4-0-8)	ICPY 473 Nuclear Physics	4 (4-0-8)
ICPY 342 Integrated Laboratory in Physics II	2 (0-4-2)	ICPY 474 Astrophysics	4 (4-0-8)
ICPY 343 Integrated Laboratory in Physics III	2 (0-4-2)	ICPY 484 Cosmology	4 (4-0-8)
ICPY 355 Special Topics in Physics I	4 (4-0-8)	ICPY 486 Observational Astronomy	4 (4-0-8)
ICPY 356 Special Topics in Physics II	4 (4-0-8)	ICPY 487 Data Analysis in Astronomy	4 (4-0-8)
ICPY 357 Special Topics in Laboratory Physics I	4 (3-2-7)	ICPY 488 Special Topics in Astronomy	4 (4-0-8)
ICPY 361 Quantum Mechanics I	4 (4-0-8)	ICPY 490 Computational Physics	4 (4-0-8)
ICPY 371 Thermal Physics	4 (4-0-8)	ICPY 492 Electronics	4 (4-0-8)
ICPY 451 Analytical Mechanics	4 (4-0-8)	ICPY 496 Biophysics	4 (4-0-8)
ICPY 452 Statistical Mechanics	4 (4-0-8)		

Minor in PHYSICS: for ≥638xxxx	
<p>Physics program offers a minor degree in Physics for students from other programs. Physics Students may choose to take minor offered by other programs in MUIC. In order to obtain minor, students are required to complete all requirements as specified by each minor.</p>	
at least 20 credits	Credit
ICPY 200 Modern Physics	4 (4-0-8)
ICPY 321 Intermediate Mechanics	4 (4-0-8)
ICPY 322 Electricity and Magnetism	4 (4-0-8)
ICPY 361 Quantum Mechanics I	4 (4-0-8)
ICPY 452 Statistical Mechanics	4 (4-0-8)