

College of SCIENCE
 Academy of Integrated Science
Minor in QUANTUM INFORMATION SCIENCE AND ENGINEERING
 For student date of entry under UG Catalog 2022-2023

- *The Minor in Quantum Information Science and Engineering requires a minimum of 20 credit hours.*
- *Courses below marked by * have prerequisites or corequisites. Students are required to double check course prerequisites and corequisites. Please see your advisor or consult the Undergraduate Course Catalog for more information about prerequisites and corequisites.*

I. Required courses (12 credit hours)

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|--|----------------------------|
| *MATH 2114 Intro to Linear Algebra or *MATH 3144 Linear Algebra I# | 3 <input type="checkbox"/> |
| PHYS 2254 Hello Quantum World! | 3 <input type="checkbox"/> |
| *CHEM/PHYS 3684 Quantum Software I | 2 <input type="checkbox"/> |
| *CHEM/PHYS 4684 Quantum Software II | 1 <input type="checkbox"/> |
| *PHYS 4254 Quantum Information Technologies | 3 <input type="checkbox"/> |

II. Select 3 credit hours from the list below:

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|--|----------------------------|
| *PHYS 4264 Quantum Optics and Qubit Processors& | 3 <input type="checkbox"/> |
| *CS 4134 Quantum Computation and Information Processing& | 3 <input type="checkbox"/> |

III. Select at least 3 credit hours from the list below:

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|---|----------------------------|
| *PHYS 3314 Intermediate Laboratory | 3 <input type="checkbox"/> |
| *PHYS 3324 Modern Physics | 4 <input type="checkbox"/> |
| *PHYS 3406 Intermediate Electricity and Magnetism | 3 <input type="checkbox"/> |
| *MATH 3034 Introduction to Proofs | 3 <input type="checkbox"/> |
| *MATH 3144 Linear Algebra I# | 3 <input type="checkbox"/> |
| CS 1064 Introduction to Programming in Python | 3 <input type="checkbox"/> |
| *CS 2064 Intermediate Programming in Python | 3 <input type="checkbox"/> |
| *CS 2114 Software Design and Data Structures | 3 <input type="checkbox"/> |
| *CS 3114 Data Structures and Algorithms | 3 <input type="checkbox"/> |
| *CMDA/CS/STAT 3654 Introduction to Data Analytics and Visualization | 3 <input type="checkbox"/> |
| *CHEM 3616 Physical Chemistry | 3 <input type="checkbox"/> |
| *ECE 2024 Circuits and Devices | 3 <input type="checkbox"/> |
| *ECE 2214 Physical Electronics | 3 <input type="checkbox"/> |
| *ECE 2514 Computational Engineering | 3 <input type="checkbox"/> |
| *ECE 2714 Signals and Systems | 3 <input type="checkbox"/> |
| *ECE 3105 Electromagnetic Fields | 3 <input type="checkbox"/> |
| *ECE 3134 Introduction to Optoelectronics | 3 <input type="checkbox"/> |
| *ECE 3214 Semiconductor Device Fundamentals | 3 <input type="checkbox"/> |
| *ECE 3604 Introduction to RF & Microwave Engineering | 3 <input type="checkbox"/> |
| *ECE 3614 Introduction to Communication Systems | 3 <input type="checkbox"/> |
| *ECE 3714 Introduction to Control Systems | 3 <input type="checkbox"/> |
| *MSE 2054 Fundamentals of Materials Science | 3 <input type="checkbox"/> |
| *MSE 3204 Fundamentals of Electronic Materials | 3 <input type="checkbox"/> |

IV. Select at least 2 credit hours from the list below:

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|---|----------------------------|
| *PHYS 4264 Quantum Optics and Qubit Processors& | 3 <input type="checkbox"/> |
| *PHYS 4315 Modern Experimental Physics | 2 <input type="checkbox"/> |
| *PHYS 4455 Introduction to Quantum Mechanics | 3 <input type="checkbox"/> |
| *PHYS 4456 Introduction to Quantum Mechanics | 3 <input type="checkbox"/> |
| *PHYS 4554 Introduction to Solid State Physics | 3 <input type="checkbox"/> |
| *PHYS 5455 Quantum Mechanics | 3 <input type="checkbox"/> |
| *CHEM 4404 Physical Inorganic Chemistry | 3 <input type="checkbox"/> |
| *MATH 4175 Cryptography | 3 <input type="checkbox"/> |
| *MATH 4176 Cryptography | 3 <input type="checkbox"/> |
| *MATH 4445 Introduction to Numerical Analysis | 3 <input type="checkbox"/> |
| *CS/MATH 4414 Issues in Scientific Computing | 3 <input type="checkbox"/> |
| *CS 4104 Data and Algorithm Analysis | 3 <input type="checkbox"/> |

*CS 4134 Quantum Computation and Information Processing&	3	<input type="checkbox"/>
*CMDA/CS/STAT 4654 Intermediate Data Analytics and Machine Learning	3	<input type="checkbox"/>
*CS/STAT 5525 Data Analytics	3	<input type="checkbox"/>
*CS/STAT 5526 Data Analytics	3	<input type="checkbox"/>
*ECE 4104 Microwave and RF Engineering	4	<input type="checkbox"/>
*ECE 4134 Photonics	3	<input type="checkbox"/>
*ECE 4424/CS 4824 Machine Learning	3	<input type="checkbox"/>
*ECE 4614 Telecommunication Networks	3	<input type="checkbox"/>
*ECE 4634 Digital Communications	3	<input type="checkbox"/>
*ECE 5634 Information Theory	3	<input type="checkbox"/>
*MSE/ECE 4234 Semiconductor Processing	3	<input type="checkbox"/>

Total credit hours: minimum 20 credit hours.

V. Notes

- (1) Minimum GPA
Must have a 2.0 or higher for all courses used to complete this minor.
- (2) * Prerequisites and corequisites
For the courses listed above marked by *, prerequisites and/or corequisites apply. Students are required to double check course prerequisites and corequisites. Please see your advisor or consult the Undergraduate Course Catalog for more information.
- (3) # This course can only count once. If taken in set I (Required courses), it cannot be counted as an elective from set III.
- (4) & This course can only count once. If taken in set II, it cannot be counted as an elective from set IV.