# CHEMISTRY (BS) - SECONDARY EDUCATION

## Overview

The Chemistry and Secondary Education degree track is offered in collaboration with the College of Education and Health Professions. This track is designed for students with an interest in teaching chemistry at the secondary level or pursuing graduate studies in chemical or science education. In addition to the general degree requirements, the track requires satisfactory completion of courses in chemistry, mathematics, physics, and education. The education components of the track are offered through an innovative teacher preparation program (UTeach Columbus (http://uteach.columbusstate.edu/)). A broad range of upper-level elective courses in chemistry exists to expose students to modern fields within the chemical sciences and to help students broaden their understanding of science education.

All educator preparation programs are approved by the Georgia Professional Standards Commission. In addition to the degree requirements, there are further requirements for teaching certification. Visit the Certification page (https://cqtl.columbusstate.edu/certification.php) on the CSU Center for Quality Teaching and Learning (CQTL) website for detailed information about certification requirements and the certification process.

## Program of Study

| Code | Title | Credit Hours |
|---|---|---|
| **Core IMPACTS Area : Institutional Priorities** [1] | | **7** |
| Take one of the following courses | | |
| ITDS 1779 | Scholarship Across the Disciplines | |
| LEAD 1705 | Introduction to Servant Leadership | |
| PERS 1506 | Perspectives 1-hour | |
| PERS 1507 | Perspectives 2-hour | |
| Please contact your advisor for the remaining hours. | | |
| **Core IMPACTS Area : Mathematics & Quantitative Skills** [1] | | **3-7** |
| DATA 1501 | Introduction to Data Science | 3 |
| MATH 1001 | Quantitative Skills and Reasoning | 3 |
| MATH 1101 | Introduction to Mathematical Modeling | 3 |
| MATH 1111 | College Algebra | 3 |
| MATH 1113 | Pre-Calculus | 4 |
| MATH 1125 | Applied Calculus | 3 |
| MATH 1131 | Calculus with Analytic Geometry I | 4 |
| MATH 1132 | Calculus with Analytic Geometry II | 4 |
| MATH 1165 | Computer-Assisted Problem Solving | 3 |
| MATH 1401 | Introduction to Statistics | 3 |
| MATH 1501 | Calculus I | 4 |
| MATH 2125 | Introduction to Discrete Mathematics | 3 |
| STAT 1401 | Elementary Statistics | 3 |
| **Core IMPACTS Area : Political Science and U.S. History** | | **6** |
| HIST 2111 | U. S. History to 1865 | 3 |
| or HIST 2112 | U. S. History since 1865 | |
| POLS 1101 | American Government | 3 |
| **Core IMPACTS Area : Arts, Humanities, and Ethics** | | **6** |
| Select one Fine Arts course | | 3 |
| ARTH 1100 | Art Appreciation | |
| ARTH 2125 | Introduction to the History of Art I– Prehistoric through Gothic | |
| ARTH 2126 | Introduction to the History of Art II– Renaissance through Modern | |
| MUSC 1100 | Music Appreciation | |
| THEA 1100 | Theatre Appreciation | |
| ITDS 1145 | Comparative Arts [2] | |
| Select one Humanities course | | 3 |
| ENGL 2111 | World Literature I | |
| ENGL 2112 | World Literature II | |
| ITDS 1155 | The Western Intellectual Tradition | |
| ITDS 1774 | Introduction to Digital Humanities | |
| PHIL 2010 | Introduction to Philosophy | |
| ITDS 1145 | Comparative Arts [2] | |
| **Core IMPACTS Area : Communicating in Writing** | | **6** |
| ENGL 1101 | English Composition I | 3 |
| ENGL 1102 | English Composition II | 3 |
| **Core IMPACTS Area : Technology, Mathematics, and Sciences** [1,3] | | **7-11** |
| ANTH 1145 | Human Origins | 3 |
| ASTR 1105 | Descriptive Astronomy: The Solar System | 3 |
| ASTR 1106 | Descriptive Astronomy: Stars and Galaxies | 3 |
| ASTR 1305 | Descriptive Astronomy Lab | 1 |
| ATSC 1112 | Understanding the Weather | 3 |
| ATSC 1112L | Understanding the Weather Lab | 1 |
| BIOL 1125 | Contemporary Issues in Biology Non-Lab | 3 |
| BIOL 1215K | Introductory Biology | 4 |
| BIOL 1225K | Contemporary Issues in Biology with Lab | 4 |
| CHEM 1151 & 1151L | Survey of Chemistry I and Survey of Chemistry I Lab | 4 |
| CHEM 1152 & 1152L | Survey of Chemistry II and Survey of Chemistry II Lab | 4 |
| CHEM 1211 & 1211L | Principles of Chemistry I and Principles of Chemistry I Lab | 4 |
| CHEM 1212 & 1212L | Principles of Chemistry II and Principles of Chemistry II Lab | 4 |
| CPSC 1105 | Introduction to Computing Principles and Technology | 3 |
| CPSC 1301K | Computer Science I | 4 |
| ENVS 1105 | Environmental Studies | 3 |
| ENVS 1105L | Environmental Studies Laboratory | 1 |
| ENVS 1205K | Sustainability and the Environment | 4 |
| GEOG 2215 | Introduction to the Geographic Information Systems | 3 |
| GEOL 1110 | Natural Disasters: Our Hazardous Environment | 3 |
| GEOL 1121 | Introductory Geoscience I: Physical Geology | 3 |
| GEOL 1121L | Introductory Geoscience I: Physical Geology Lab | 1 |
| GEOL 1122 | Introductory Geo-sciences II: Historical Geology | 3 |
| GEOL 1322 | Introductory Geo-sciences II: Historical Geology Lab | 1 |
| GEOL 2225 | The Fossil Record | 4 |
| PHYS 1111 & PHYS 1311 | Introductory Physics I and Introductory Physics I Lab | 4 |

| | | |
|---|---|---|
| PHYS 1112 & PHYS 1312 | Introductory Physics II and Introductory Physics II Lab | 4 |
| PHYS 1125 | Physics of Color and Sound | 3 |
| PHYS 1325 | Physics of Color and Sound Lab | 1 |
| PHYS 2211 & PHYS 2311 | Principles of Physics I and Principles of Physics I Lab | 4 |
| PHYS 2212 & PHYS 2312 | Principles of Physics II and Principles of Physics II Lab | 4 |
| **Core IMPACTS Area : Social Sciences** | | **6** |
| Select one Behavioral Science course | | |
| ECON 2105 | Principles of Macroeconomics | |
| ECON 2106 | Principles of Microeconomics | |
| PHIL 2030 | Moral Philosophy | |
| PSYC 1101 | Introduction to General Psychology | |
| SOCI 1101 | Introduction to Sociology | |
| Select one World Cultures course | | 3 |
| ANTH 1107 | Discovering Archaeology | |
| ANTH 1105 | Cultural Anthropology | |
| ANTH 2105 | Ancient World Civilizations | |
| ANTH 2136 | Language and Culture | |
| ENGL 2136 | Language and Culture | |
| GEOG 1101 | World Regional Geography | |
| HIST 1111 | World History to 1500 | |
| HIST 1112 | World History since 1500 | |
| ITDS 1156 | Understanding Non-Western Cultures | |
| **Core IMPACTS Total Hours** | | **42** |

[1] The hours applied in the Institutional Priorities; Mathematics & Quantitative Skills; and Technology, Mathematics, and Sciences areas must add to 18 credit hours.

[2] ITDS 1145 Comparative Arts, though listed under both Fine Arts and Humanities, may be taken only once.

[3] At least 4 of the credit hours in this area must be in a lab science course.

**Major Requirements**

| Code | Title | Credit Hours |
|---|---|---|
| **Core Requirements** | | |
| Complete the core requirements for this program | | 45 |
| **Field of Study Requirements** | | |
| Students must have a grade of C or better in the courses used to satisfy the major. | | |
| Apply one hour of approved electives | | 1 |
| CHEM 1715 | Introductory Chemistry Seminar | 1 |
| CHEM 1211 | Principles of Chemistry I | 3 |
| CHEM 1211L | Principles of Chemistry I Lab | 1 |
| CHEM 1212 | Principles of Chemistry II | 3 |
| CHEM 1212L | Principles of Chemistry II Lab | 1 |
| Complete a physics course sequence (Principles required for ACS Track). | | 8 |
| Introductory Physics Sequence: | | |
| PHYS 1111 | Introductory Physics I | |
| PHYS 1311 | Introductory Physics I Lab | |
| PHYS 1112 | Introductory Physics II | |
| PHYS 1312 | Introductory Physics II Lab | |
| Principles of Physics Sequence: | | |
| PHYS 2211 | Principles of Physics I | |
| PHYS 2311 | Principles of Physics I Lab | |
| PHYS 2212 | Principles of Physics II | |
| PHYS 2312 | Principles of Physics II Lab | |
| Field of Study Requirements Total | | 18 |
| **Required for the Major** | | |
| Students must have a grade of C or better in the courses used to satisfy the major. | | |
| MATH 1131 | Calculus with Analytic Geometry I | 4 |
| CHEM 2115 | Quantitative Chemical Analysis | 3 |
| CHEM 2315 | Quantitative Chemical Analysis Lab | 1 |
| CHEM 3111 | Organic Chemistry I | 3 |
| CHEM 3135 | Inorganic Chemistry | 3 |
| CHEM 3141 | Biochemistry I | 3 |
| CHEM 3345 | Biochemistry Lab I | 1 |
| CHEM 3311 | Organic Chemistry I Lab | 1 |
| CHEM 3335 | Inorganic Chemistry Lab | 1 |
| CHEM 4115 | Foundations of Physical Chemistry | 3 |
| CHEM 4175 | Instrumental Methods of Chemical Analysis | 3 |
| CHEM 4375 | Instrumental Methods of Chemical Analysis Lab | 1 |
| CHEM 4315 | Foundations of Physical Chemistry Lab | 1 |
| Select the following UTeach Columbus Courses (only two attempts allowed for each of the following courses): | | |
| UTCH 1201 | Step I: Inquiry Approaches to Teaching | 1 |
| UTCH 1202 | Step II: Inquiry-Based Lesson Design | 1 |
| UTCH 2105 | Knowing and Learning in Mathematics and Science | 3 |
| UTCH 2203 | | 3 |
| SPED 2256 | Introduction to the Exceptional Learner in General Education | 3 |
| UTCH 3205 | Classroom Interactions | 3 |
| UTCH 4205 | Inquiry-Based Instruction | 3 |
| UTCH 4485 | Student Teaching | 8 |
| UTCH 4795 | Student Teaching Seminar | 1 |
| EDUC 5140U | Foundations of Reading, Literacy, and Language | 3 |
| Required for the Major Total | | 57 |
| **General Electives** | | |
| Choose 3 general elective credits. | | 3 |
| General Electives Total | | 3 |
| **Total Credit Hours** | | **123** |

# Program Map

| Course | Title | Credit Hours |
|---|---|---|
| **First Year** | | |
| **Fall** | | |
| CHEM 1211 | Principles of Chemistry I (minimum grade of C) | 3 |
| CHEM 1211L | Principles of Chemistry I Lab (minimum grade of C) | 1 |

| | | |
|---|---|---|
| MATH 1113 | Pre-Calculus (minimum grade of C) | 4 |
| ENGL 1101 | English Composition I (minimum grade of C) | 3 |
| Arts, Humanities, and Ethics | Fine Arts | 3 |
| KINS 1106 or PHED 1205 | Lifetime Wellness or Concepts of Fitness | 2 |
| CHEM 1715 | Introductory Chemistry Seminar (Area G) [1] | 1 |
| | **Credit Hours** | **17** |
| **Spring** | | |
| CHEM 1212 | Principles of Chemistry II (minimum grade of C) [2] | 3 |
| CHEM 1212L | Principles of Chemistry II Lab (minimum grade of C) [2] | 1 |
| MATH 1131 | Calculus with Analytic Geometry I | 4 |
| ENGL 1102 | English Composition II (minimum grade of C) | 3 |
| HIST 2111 or HIST 2112 | U. S. History to 1865 or U. S. History since 1865 | 3 |
| Health and Wellness | PEDS Physical Education | 1 |
| Institutional Priorities | ITDS 1779 (2), LEAD 1705 (2), PERS 1506 (1; may be repeated with different topic), PERS 1507 (2) | 1 |
| | **Credit Hours** | **16** |
| **Second Year** | | |
| **Fall** | | |
| CHEM 3111 | Organic Chemistry I (minimum grade of C) [3] | 3 |
| CHEM 3311 | Organic Chemistry I Lab (minimum grade of C) [3] | 1 |
| PHYS 1111 | Introductory Physics I (minimum grade of C) | 3 |
| PHYS 1311 | Introductory Physics I Lab (minimum grade of C) | 1 |
| BIOL 1231K | | 4 |
| Arts, Humanities, and Ethics | Humanities Elective (ITDS 2125 recommended) [4] | 3 |
| UTCH 1201 | Step I: Inquiry Approaches to Teaching | 1 |
| | **Credit Hours** | **16** |
| **Spring** | | |
| PHYS 1112 | Introductory Physics II (minimum grade of C) | 3 |
| PHYS 1312 | Introductory Physics II Lab (minimum grade of C) | 1 |
| BIOL 1232K | | 4 |
| Institutional Priorities | COMM 1110 Public Speaking or foreign language 1001, 1002, 2001, 2002 [5] | 3 |
| UTCH 1202 | Step II: Inquiry-Based Lesson Design | 1 |
| Social Sciences | World Culture Elective | 3 |
| | **Credit Hours** | **15** |
| **Third Year** | | |
| **Fall** | | |
| CHEM 2115 | Quantitative Chemical Analysis (minimum grade of C) [6] | 3 |
| CHEM 2315 | Quantitative Chemical Analysis Lab (minimum grade of C) [6] | 1 |
| UTCH 2105 | Knowing and Learning in Mathematics and Science | 3 |
| Program Requirements | Foreign Language (1002) | 3 |
| POLS 1101 | American Government | 3 |
| Select one of the following: | | 3 |
| ITDS 2125 or UTCH 2203 | Historical Perspectives on the Philosophy of Science and Mathematics (if not taken in Area C) [7] or Step III: Technological and Pedagogical Content Knowledge | |
| | **Credit Hours** | **16** |
| **Spring** | | |
| CHEM 4175 | Instrumental Methods of Chemical Analysis (minimum grade of C) [8] | 3 |
| CHEM 4375 | Instrumental Methods of Chemical Analysis Lab (minimum grade of C) | 1 |
| CHEM 3135 | Inorganic Chemistry (minimum grade of C) | 3 |
| CHEM 3335 | Inorganic Chemistry Lab (minimum grade of C) | 1 |
| STAT 1401 | Elementary Statistics | 3 |
| Program Requirements | Foreign Language (2001) | 3 |
| UTCH 3205 | Classroom Interactions | 3 |
| | **Credit Hours** | **17** |
| **Fourth Year** | | |
| **Fall** | | |
| UTCH 3215 | Research Methods | 3 |
| UTCH 4205 | Inquiry-Based Instruction | 3 |
| Social Sciences | Behavioral Science Elective | 3 |
| CHEM 4115 | Foundations of Physical Chemistry (minimum grade of C) | 3 |
| CHEM 4315 | Foundations of Physical Chemistry Lab (minimum grade of C) | 1 |
| CHEM 4794 | Capstone Seminar (minimum grade of C) | 1 |
| | **Credit Hours** | **14** |
| **Spring** | | |
| UTCH 4485 | Student Teaching | 9 |
| UTCH 4795 | Student Teaching Seminar | 1 |
| SPED 4115 | Teaching Math and Science to Exceptional Learners (see note below) | 2 |
| | There is a recent rule change for certification from the GaPSC. As of July 1, 2019, students must make a B or higher in the Exceptional Children's course. The course could be any of the following depending on your major: SPED 2256, EDCI 6228, KINS 4245, SPED 4115, PHED 6219 This rule change will not affect your graduation but you cannot become a certified educator with the state of Georgia until you receive the grade of B or higher in this course. | |
| | **Credit Hours** | **12** |
| | **Total Credit Hours** | **123** |

[1] This course can be taken Fall 1 or Spring 1, depending on when course is offered.
[2] The Principles of Chemistry sequence are offered each semester and summer. These must be completed by the summer.
[3] Organic Chemistry 1 and the co-requisite lab are only offered in the fall semester.
[4] ITDS 2125 Historical Perspectives on the Philosophy of Science and Mathematics is required for this degree track. It can be taken either as a Humanities course (in the Arts/Humanities/Ethics course choice) or in Program Requirements, as extra credits added to the degree program.
[5] Enroll in foreign language 1001 if you need a refresher course or want to start a new language.
[6] Quantitative Chemical Analysis and the co-requisite lab are only offered in the fall semester.
[7] If ITDS 2125 Historical Perspectives on the Philosophy of Science and Mathematics is not taken in Fall 2 as an Area C Humanities course, then take it in Fall 3 as an Area G requirement.
[8] Instrumental Analysis and the co-requisite lab are only offered in the spring semester.

- To graduate, a student must have 39 credits of upper-division courses (3000 level or higher). These courses may be in any discipline.
- A grade of "C" or higher is required for all chemistry courses.
- The prerequisite for Principles of Chemistry 1 (CHEM 1211 Principles of Chemistry I) and its co-requisite lab is College Algebra (MATH 1111 College Algebra) with a grade of "C" or higher or placement in MATH 1113 Pre-Calculus or higher.
- Introductory Physics 1 and 2 are required for completion of the B.S. in chemistry.
- The prerequisite for Introductory Physics 1 (PHYS 1111 Introductory Physics I) and its lab is pre-calculus (MATH 1113 Pre-Calculus) or higher.
- The prerequisite for Organic Chemistry 2 (CHEM 3112 Organic Chemistry II) and its co-requisite lab (CHEM 3312 Organic Chemistry II Lab) are Organic Chemistry 1 (CHEM 3111 Organic Chemistry I) and its co-requisite lab (CHEM 3311 Organic Chemistry I Lab) with a "C" or higher in each.
- The prerequisite for Biochemistry 1 (CHEM 3141 Biochemistry I) and its co-requisite lab (CHEM 3345 Biochemistry Lab I) are Organic Chemistry 1 (CHEM 3111 Organic Chemistry I) and its co-requisite lab (CHEM 3311 Organic Chemistry I Lab) with a "C" or higher in each.
- The prerequisite for Inorganic Chemistry (CHEM 3135 Inorganic Chemistry) and its co-requisite lab (CHEM 3335 Inorganic Chemistry Lab) are Organic Chemistry 2 (CHEM 3112 Organic Chemistry II) and its co-requisite lab (CHEM 3312 Organic Chemistry II Lab) with a "C" or higher.
- The prerequisite for Foundations of Physical Chemistry (CHEM 4115 Foundations of Physical Chemistry and its co-requisite lab (CHEM 4315 Foundations of Physical Chemistry Lab are Calculus 1 (MATH 1131 Calculus with Analytic Geometry I) and Introductory Physics 2 (PHYS 1112 Introductory Physics II) and its lab with a "C" or higher.
- Foundations of Physical Chemistry lecture and lab may be offered at night, i.e. 4:30 - 5:45 for the lecture and 6:00 - 8:50 for lab.
- The prerequisite for Instrumental Methods of Chemical Analysis (CHEM 4175 Instrumental Methods of Chemical Analysis and its co-requisite lab (CHEM 4375 Instrumental Methods of Chemical Analysis Lab are Quantitative Chemical Analysis (CHEM 2115 Quantitative Chemical Analysis) and its co-requisite lab (CHEM 2315 Quantitative Chemical Analysis Lab), Organic Chemistry 2 and its co-requisite Lab (CHEM 3312 Organic Chemistry II Lab), and Calculus 1 (MATH 1131 Calculus with Analytic Geometry I). A minimum grade of "C" or higher is required to satisfy the prerequisite requirement.
- Inorganic Chemistry and its co-requisite lab (CHEM 3135 Inorganic Chemistry and CHEM 3335 Inorganic Chemistry Lab) may be offered in the fall or spring semester.
- Quantitative Analysis and its co-requisite lab (CHEM 2115 Quantitative Chemical Analysis and CHEM 2315 Quantitative Chemical Analysis Lab) are only offered in the fall semester.
- Instrumental Methods of Chemical Analysis (CHEM 4175 Instrumental Methods of Chemical Analysis) is only offered in the spring semester.
- Inorganic Chemistry and its co-requisite lab (CHEM 3135 Inorganic Chemistry and CHEM 3335 Inorganic Chemistry Lab) may be offered in the fall or spring semester.
- Organic Chemistry 1 and its co-requisite lab (CHEM 3111 Organic Chemistry I and CHEM 3311 Organic Chemistry I Lab) are only offered in the fall semester and Organic Chemistry 2 and its co-requisite lab (CHEM 3112 Organic Chemistry II and CHEM 3312 Organic Chemistry II Lab) are only offered in the spring semester.

# Program Map

# Admission Requirements

There are no program specific admission requirements.

# Additional Program Requirements

There are no program specific academic regulations.