

# MAJOR IN GEOSCIENCES, GEOLOGY CONCENTRATION

The Geology concentration within the Geosciences major provides comprehensive, broad-based training in geology, emphasizing a practical and field-oriented approach. The core classes in the concentration cover the structure of the Earth and the nature and study of Earth materials - rocks, minerals, sediments. Elective classes allow students to study energy, mineral and water resources of the Earth, formation of rock types, landforms, and techniques such as remote sensing.

## Learning Objectives

Upon successful completion of this program, students will be able to:

1. Demonstrate foundational skills and knowledge in all sub-disciplines of geology (physical and historical geology, earth materials, sedimentology and stratigraphy, structural geology)
2. Exhibit valuable skills in scientific reasoning, quantitative data analysis and reasoning; field, analytical, and remote sensing skills;

spatial thinking and map use enabling them to contribute effectively to professional work and engage in original research.

3. Use visualization tools, theory, computation, and simulations to explain field observations and experimental results, make interpretations and test hypotheses.
4. Obtain, organize, and critically evaluate geologic information, and effectively present it through oral and written discourse with specialists and non-specialists.
5. Ethically and responsibly engage their knowledge of geology to address current global and scientific challenges.
6. Apply sustainability principles that incorporate complex environmental, economic, and social factors.
7. Demonstrate in-depth skills and knowledge in earth materials.
8. Describe the Earth's physical and chemical nature and how this has evolved through Earth's four and a half billion year history.
9. Demonstrate in-depth skills in a sub-discipline of geology.

## Requirements Effective Fall 2026

### Freshman

|                                                                                                                                                                                                                                                                                |                                             | AUCC | Credits   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------|-----------|
| CHEM 111                                                                                                                                                                                                                                                                       | General Chemistry I (GT-SC2)                | 3A   | 4         |
| CHEM 112                                                                                                                                                                                                                                                                       | General Chemistry Lab I (GT-SC1)            | 3A   | 1         |
| CO 150                                                                                                                                                                                                                                                                         | College Composition (GT-CO2)                | 1A   | 3         |
| GEOL 150 <sup>1</sup>                                                                                                                                                                                                                                                          | Dynamic Earth (GT-SC2)                      | 3A   | 4         |
| GEOL 154                                                                                                                                                                                                                                                                       | Earth and Climate Change Through Time       |      | 4         |
| GEOL 192                                                                                                                                                                                                                                                                       | New Student Seminar--Exploring Geosciences  |      | 1         |
| MATH 160 <sup>2</sup>                                                                                                                                                                                                                                                          | Calculus for Physical Scientists I (GT-MA1) | 1B   | 4         |
| 1C ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc</a> )                                                                           |                                             | 1C   | 3         |
| Social and Behavioral Sciences ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioural-sciences">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioural-sciences</a> ) |                                             | 3C   | 3         |
| Elective                                                                                                                                                                                                                                                                       |                                             |      | 3         |
| <b>Total Credits</b>                                                                                                                                                                                                                                                           |                                             |      | <b>30</b> |

### Sophomore

|                                       |                                                 |    |   |
|---------------------------------------|-------------------------------------------------|----|---|
| CHEM 113                              | General Chemistry II                            |    | 3 |
| CHEM 114                              | General Chemistry Lab II                        |    | 1 |
| GEOL 310                              | Earth Materials                                 |    | 4 |
| GEOL 311                              | Earth's Interior                                |    | 3 |
| GEOL 312                              | Earth's Surface                                 |    | 2 |
| GEOL 313                              | Earth Systems                                   |    | 2 |
| GEOL 314                              | Earth's Surface Laboratory                      |    | 1 |
| MATH 161 <sup>3</sup>                 | Calculus for Physical Scientists II (GT-MA1)    | 1B | 4 |
| Select one course from the following: |                                                 |    | 3 |
| CO 300                                | Writing Arguments (GT-CO3)                      | 2  |   |
| CO 301B                               | Writing in the Disciplines: Sciences (GT-CO3)   | 2  |   |
| JTC 300                               | Strategic Writing and Communication (GT-CO3)    | 2  |   |
| Select one course from the following: |                                                 |    | 5 |
| PH 121                                | General Physics I (GT-SC1)                      | 3A |   |
| PH 141                                | Physics for Scientists and Engineers I (GT-SC1) | 3A |   |

|                                                                                                                                                                                                                                                                 |                                               |       |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------|-----------|
| Historical Perspectives ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives</a> ) |                                               | 3D    | 3         |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                               |       | <b>31</b> |
| <b>Junior</b>                                                                                                                                                                                                                                                   |                                               |       |           |
| GEOL 344                                                                                                                                                                                                                                                        | Stratigraphy and Sedimentology                | 4A    | 3         |
| GEOL 364                                                                                                                                                                                                                                                        | Igneous and Metamorphic Petrology             |       | 3         |
| GEOL 372                                                                                                                                                                                                                                                        | Structural Geology                            | 4B    | 4         |
| GEOL 376                                                                                                                                                                                                                                                        | Geologic Field Methods                        | 4A,4C | 2         |
| NR 319                                                                                                                                                                                                                                                          | Introduction to Geospatial Science            |       | 4         |
| Select one course from the following:                                                                                                                                                                                                                           |                                               |       | 3-4       |
| MATH 340                                                                                                                                                                                                                                                        | Intro to Ordinary Differential Equations      |       |           |
| STAT 301                                                                                                                                                                                                                                                        | Introduction to Applied Statistical Methods   |       |           |
| STAT 315                                                                                                                                                                                                                                                        | Intro to Theory and Practice of Statistics    |       |           |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities</a> )                     |                                               | 3B    | 3         |
| Elective                                                                                                                                                                                                                                                        |                                               |       | 2-3       |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                               |       | <b>25</b> |
| <b>Summer</b>                                                                                                                                                                                                                                                   |                                               |       |           |
| GEOL 476                                                                                                                                                                                                                                                        | Field Geoscience Capstone                     | 4A,4C | 4         |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                               |       | <b>4</b>  |
| <b>Senior</b>                                                                                                                                                                                                                                                   |                                               |       |           |
| GEOL 476                                                                                                                                                                                                                                                        | Field Geoscience Capstone                     | 4A,4C | 2         |
| Select a minimum of 15 credits from the following Technical Electives. A minimum of 9 credits must be from the GEOL subject code:                                                                                                                               |                                               |       | 15        |
| ATS 440/GES 440                                                                                                                                                                                                                                                 | Sea Level Rise and a Sustainable Future       |       |           |
| CHEM 245                                                                                                                                                                                                                                                        | Fundamentals of Organic Chemistry             |       |           |
| CHEM 341                                                                                                                                                                                                                                                        | Modern Organic Chemistry I                    |       |           |
| CIVE 322                                                                                                                                                                                                                                                        | Basic Hydrology                               |       |           |
| CIVE 440                                                                                                                                                                                                                                                        | Nonpoint Source Pollution                     |       |           |
| CIVE 529                                                                                                                                                                                                                                                        | Environmental Organic Chemistry               |       |           |
| DSCI 335                                                                                                                                                                                                                                                        | Inferential Reasoning in Data Analysis        |       |           |
| GR 323/NR 323                                                                                                                                                                                                                                                   | Remote Sensing and Image Interpretation       |       |           |
| GEOL 332                                                                                                                                                                                                                                                        | Optical Mineralogy                            |       |           |
| GEOL 340                                                                                                                                                                                                                                                        | Glacial Geology                               |       |           |
| GEOL 342                                                                                                                                                                                                                                                        | Paleontology                                  |       |           |
| GEOL 343                                                                                                                                                                                                                                                        | Dinosaur Paleontology Field Camp              |       |           |
| GEOL 366                                                                                                                                                                                                                                                        | Low-Temperature Geochemistry                  |       |           |
| GEOL 401                                                                                                                                                                                                                                                        | Geology of the Rocky Mountain Region          |       |           |
| GEOL 415                                                                                                                                                                                                                                                        | Critical Zone Science                         |       |           |
| GEOL 440                                                                                                                                                                                                                                                        | Geodetic and Near-Surface Geophysical Methods |       |           |
| GEOL 442                                                                                                                                                                                                                                                        | Applied Geophysics                            |       |           |
| GEOL 446                                                                                                                                                                                                                                                        | Environmental Geology                         |       |           |
| GEOL 447                                                                                                                                                                                                                                                        | Mineral Deposits                              |       |           |
| GEOL 450                                                                                                                                                                                                                                                        | Reservoir Geosciences Fluid Storage Flow      |       |           |
| GEOL 452                                                                                                                                                                                                                                                        | Hydrogeology                                  |       |           |
| GEOL 454                                                                                                                                                                                                                                                        | Geomorphology                                 |       |           |
| GEOL 477                                                                                                                                                                                                                                                        | Isotope Geology and Geochronology             |       |           |
| MATH 261                                                                                                                                                                                                                                                        | Calculus for Physical Scientists III          |       |           |
| MATH 340                                                                                                                                                                                                                                                        | Intro to Ordinary Differential Equations      |       |           |
| MATH 369                                                                                                                                                                                                                                                        | Linear Algebra I                              |       |           |

|                                                                                                                                                                                                                                             |                                                 |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------|
| NR 300                                                                                                                                                                                                                                      | Biological Diversity                            |            |
| NR 400                                                                                                                                                                                                                                      | Public Communication in Natural Resources       |            |
| NR 422                                                                                                                                                                                                                                      | GIS Applications in Natural Resource Management |            |
| NR 426                                                                                                                                                                                                                                      | Programming for GIS I                           |            |
| NR 427                                                                                                                                                                                                                                      | Programming for GIS II                          |            |
| NR 450                                                                                                                                                                                                                                      | Geospatial Project Design and Analysis          |            |
| NR 453                                                                                                                                                                                                                                      | Geospatial Field Methods in Natural Resources   |            |
| NR 503/GR 503                                                                                                                                                                                                                               | Remote Sensing and Image Analysis               |            |
| PH 314                                                                                                                                                                                                                                      | Introduction to Modern Physics                  |            |
| PH 361                                                                                                                                                                                                                                      | Physical Thermodynamics                         |            |
| SOCR 440                                                                                                                                                                                                                                    | Pedology and Soil Survey                        |            |
| SOCR 455                                                                                                                                                                                                                                    | Microbiomes of Soil Systems                     |            |
| SOCR 470                                                                                                                                                                                                                                    | Soil Physics                                    |            |
| STAT 315 <sup>4</sup>                                                                                                                                                                                                                       | Intro to Theory and Practice of Statistics      |            |
| WR 406                                                                                                                                                                                                                                      | Seasonal Snow Environments                      |            |
| WR 416                                                                                                                                                                                                                                      | Land Use Hydrology                              |            |
| WR 418                                                                                                                                                                                                                                      | Land Use and Water Quality                      |            |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities</a> ) |                                                 | 3          |
| Electives <sup>5</sup>                                                                                                                                                                                                                      |                                                 | 10         |
| <b>Total Credits</b>                                                                                                                                                                                                                        |                                                 | <b>30</b>  |
| <b>Program Total Credits:</b>                                                                                                                                                                                                               |                                                 | <b>120</b> |

<sup>1</sup> GEOL 110, GEOL 120, GEOL 122 or GEOL 124 in combination with GEOL 121 may be substituted for GEOL 150.

<sup>2</sup> MATH 155 may be substituted for MATH 160.

<sup>3</sup> Students who substituted MATH 155 for MATH 160 should substitute MATH 255 for MATH 161.

<sup>4</sup> STAT 315 can be used to fulfill the Technical Elective requirement if not taken for the Statistics requirement in Junior year.

<sup>5</sup> Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).

## Major Completion Map

### Freshman

| Semester 1                                                                                                                                                                                                                                                                     |                                            | Critical | Recommended | AUCC | Credits   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------|-------------|------|-----------|
| CO 150                                                                                                                                                                                                                                                                         | College Composition (GT-CO2)               | X        |             | 1A   | 3         |
| GEOL 150                                                                                                                                                                                                                                                                       | Dynamic Earth (GT-SC2)                     | X        |             | 3A   | 4         |
| GEOL 192                                                                                                                                                                                                                                                                       | New Student Seminar--Exploring Geosciences | X        |             |      | 1         |
| Social and Behavioral Sciences ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioural-sciences">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioural-sciences</a> ) |                                            |          | X           | 3C   | 3         |
| Elective                                                                                                                                                                                                                                                                       |                                            |          | X           |      | 3         |
| <b>Total Credits</b>                                                                                                                                                                                                                                                           |                                            |          |             |      | <b>14</b> |

| Semester 2                                                                                                                                                                                           |                                             | Critical | Recommended | AUCC | Credits   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------|-------------|------|-----------|
| CHEM 111                                                                                                                                                                                             | General Chemistry I (GT-SC2)                | X        |             | 3A   | 4         |
| CHEM 112                                                                                                                                                                                             | General Chemistry Lab I (GT-SC1)            | X        |             | 3A   | 1         |
| GEOL 154                                                                                                                                                                                             | Earth and Climate Change Through Time       | X        |             |      | 4         |
| MATH 160                                                                                                                                                                                             | Calculus for Physical Scientists I (GT-MA1) | X        |             | 1B   | 4         |
| 1C ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc</a> ) |                                             | X        |             | 1C   | 3         |
| CO 150 and MATH 160 must be completed by the end of Semester 2.                                                                                                                                      |                                             | X        |             |      |           |
| <b>Total Credits</b>                                                                                                                                                                                 |                                             |          |             |      | <b>16</b> |

### Sophomore

| Semester 3 |                          | Critical | Recommended | AUCC | Credits |
|------------|--------------------------|----------|-------------|------|---------|
| CHEM 113   | General Chemistry II     | X        |             |      | 3       |
| CHEM 114   | General Chemistry Lab II | X        |             |      | 1       |

|                                                                                                                                                                                                                                                                 |                                                 |                 |                    |             |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------|--------------------|-------------|----------------|
| GEOL 310                                                                                                                                                                                                                                                        | Earth Materials                                 | X               |                    |             | 4              |
| GEOL 311                                                                                                                                                                                                                                                        | Earth's Interior                                | X               |                    |             | 3              |
| Historical Perspectives ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives</a> ) |                                                 |                 | X                  | 3D          | 3              |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>14</b>      |
| <b>Semester 4</b>                                                                                                                                                                                                                                               |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| GEOL 312                                                                                                                                                                                                                                                        | Earth's Surface                                 | X               |                    |             | 2              |
| GEOL 313                                                                                                                                                                                                                                                        | Earth Systems                                   | X               |                    |             | 2              |
| GEOL 314                                                                                                                                                                                                                                                        | Earth's Surface Laboratory                      | X               |                    |             | 1              |
| MATH 161                                                                                                                                                                                                                                                        | Calculus for Physical Scientists II (GT-MA1)    | X               |                    | 1B          | 4              |
| Select one course from the following:                                                                                                                                                                                                                           |                                                 | X               |                    |             | 3              |
| CO 300                                                                                                                                                                                                                                                          | Writing Arguments (GT-CO3)                      |                 |                    | 2           |                |
| CO 301B                                                                                                                                                                                                                                                         | Writing in the Disciplines: Sciences (GT-CO3)   |                 |                    | 2           |                |
| JTC 300                                                                                                                                                                                                                                                         | Strategic Writing and Communication (GT-CO3)    |                 |                    | 2           |                |
| Select one course from the following                                                                                                                                                                                                                            |                                                 | X               |                    |             | 5              |
| PH 121                                                                                                                                                                                                                                                          | General Physics I (GT-SC1)                      |                 |                    | 3A          |                |
| PH 141                                                                                                                                                                                                                                                          | Physics for Scientists and Engineers I (GT-SC1) |                 |                    | 3A          |                |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>17</b>      |
| <b>Junior</b>                                                                                                                                                                                                                                                   |                                                 |                 |                    |             |                |
| <b>Semester 5</b>                                                                                                                                                                                                                                               |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| GEOL 344                                                                                                                                                                                                                                                        | Stratigraphy and Sedimentology                  | X               |                    | 4A          | 3              |
| NR 319                                                                                                                                                                                                                                                          | Introduction to Geospatial Science              | X               |                    |             | 4              |
| Select one course from the following:                                                                                                                                                                                                                           |                                                 | X               |                    |             | 3-4            |
| MATH 340                                                                                                                                                                                                                                                        | Intro to Ordinary Differential Equations        |                 |                    |             |                |
| STAT 301                                                                                                                                                                                                                                                        | Introduction to Applied Statistical Methods     |                 |                    |             |                |
| STAT 315                                                                                                                                                                                                                                                        | Intro to Theory and Practice of Statistics      |                 |                    |             |                |
| Elective                                                                                                                                                                                                                                                        |                                                 |                 | X                  |             | 2-3            |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>13</b>      |
| <b>Semester 6</b>                                                                                                                                                                                                                                               |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| GEOL 364                                                                                                                                                                                                                                                        | Igneous and Metamorphic Petrology               | X               |                    |             | 3              |
| GEOL 372                                                                                                                                                                                                                                                        | Structural Geology                              | X               |                    | 4B          | 4              |
| GEOL 376                                                                                                                                                                                                                                                        | Geologic Field Methods                          | X               |                    | 4A,4C       | 2              |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities</a> )             |                                                 |                 | X                  | 3B          | 3              |
| CHEM 113 must be completed by the end of Semester 6.                                                                                                                                                                                                            |                                                 | X               |                    |             |                |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>12</b>      |
| <b>Summer</b>                                                                                                                                                                                                                                                   |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| GEOL 476                                                                                                                                                                                                                                                        | Field Geoscience Capstone                       | X               |                    | 4A,4C       | 4              |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>4</b>       |
| <b>Senior</b>                                                                                                                                                                                                                                                   |                                                 |                 |                    |             |                |
| <b>Semester 8</b>                                                                                                                                                                                                                                               |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| GEOL 476                                                                                                                                                                                                                                                        | Field Geoscience Capstone                       | X               |                    | 4A,4C       | 2              |
| Technical Electives (See list on Concentration Requirements tab)                                                                                                                                                                                                |                                                 | X               |                    |             | 9              |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities</a> )                     |                                                 |                 | X                  | 3B          | 3              |
| Elective                                                                                                                                                                                                                                                        |                                                 |                 | X                  |             | 2              |
| STAT 301 or STAT 315 or MATH 340 must be completed by the end of Semester 8.                                                                                                                                                                                    |                                                 | X               |                    |             |                |
| <b>Total Credits</b>                                                                                                                                                                                                                                            |                                                 |                 |                    |             | <b>16</b>      |
| <b>Semester 9</b>                                                                                                                                                                                                                                               |                                                 | <b>Critical</b> | <b>Recommended</b> | <b>AUCC</b> | <b>Credits</b> |
| Technical Electives (See list on Concentration Requirements tab)                                                                                                                                                                                                |                                                 | X               |                    |             | 6              |
| Electives                                                                                                                                                                                                                                                       |                                                 | X               |                    |             | 8              |

The benchmark courses for the 9th semester are the remaining courses in the entire program of study. X

|                        |     |
|------------------------|-----|
| Total Credits          | 14  |
| Program Total Credits: | 120 |