CHEMISTRY (CHEM)

CHEM 5010 - Advanced Inorganic Chemistry (3 Credits)
Covers the fundamental principles of inorganic chemistry. Topics include atomic structure and periodicity, molecular symmetry, bonding, structural chemistry, main-group chemistry, coordination chemistry, and organometallic chemistry. Prerequisite knowledge in Undergraduate Inorganic and Physical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4010. Term offered: fall. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5073 - RM-MSMSP Research Experience for Teachers - Chemistry Cohort (1-6 Credits)
The Research Experience for Teachers (RET) program will be a five-week research exploration in which twelve RM-MSMSP teachers will raise their level of relevant scientific understanding by engaging in a "hands on" workshop, transforming what they have learned into new curricular materials that will improve the scientific abilities of their students and hopefully stimulate them to consider a STEM career. Note: Credit may not apply toward any CLAS degree. Max Hours: 6 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5110 - Advanced Analytical Chemistry (3 Credits)
Explores the fundamental principles of analytical chemistry. Topics will focus on meteorology (the science of making measurements), measurements based on energy transfer (e.g. spectroscopic analysis), and measurements based on mass transfer (e.g. chemical separations and electrochemistry). Prerequisite knowledge in Undergraduate Instrumental Analysis is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4110. Term offered: spring. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5221 - Practical Applications of Spectroscopy (3 Credits)
This course surveys spectroscopic methods in order to deduce the structure of organic compounds from an examination of spectra, with an emphasis on infrared spectroscopy, mass spectometry, nuclear magnetic resonance spectroscopy, and ultraviolet spectroscopy. Students will be introduced to a wide array of powerful and elegant tools for obtaining qualitative information about the structure of matter. This course will require a good amount of thought, yet all of the concepts and associated mathematical manipulations are within the reach of a student who has met the prerequisites. Restriction: Restricted to degree-granting graduate programs. Cross-listed with CHEM 4221. Max Hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5310 - Advanced Organic Chemistry (3 Credits)
An exploration of structure, bonding and reactivity in organic modules that includes extensive analysis of the chemical literature, culminating in written and seminar presentations of individual projects. Prerequisite knowledge in Undergraduate Organic Chemistry and Physical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4310. Term offered: fall. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5510 - Computational Chemistry (3 Credits)
Classical and ab initio molecular dynamics are covered from theory to application. Students have access to high-performance computational resources and cover current topics in the field. Prerequisite knowledge in Undergraduate Physical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4510. Term offered: fall. Max Hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5530 - Advanced Physical Chemistry (3 Credits)
Explores fundamental properties of molecules (bond length and strength, the potential energy surface, reaction rates, etc.) and examines how these properties are measured, using original literature as the primary source, and culminating in written and seminar presentations of individual projects. Prerequisite knowledge in Undergraduate Physical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4530. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5550 - Applications of Group Theory in Chemistry (3 Credits)
Introduces the basic principles of the group theoretical method as well as its applications in organic, inorganic, and physical chemistry. Covers Mo's for main-group and transition metal compounds, ligand field theory, molecular vibrations, and electron absorption spectroscopy. Prerequisite knowledge in Undergraduate Physical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Max Hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5600 - Graduate Topics in Chemistry (1-3 Credits)
Graduate students in chemistry or a related discipline explore a special topic in chemistry or biochemistry. A description of topics to be covered in the current semester is maintained on the Chemistry department website. Restriction: Restricted to degree-granting Graduate programs.
Term offered: spring. Repeatable. Max hours: 6 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5610 - Understanding & Presenting Chemical Research (1-2 Credits)
This course will improve your ability to systematically search for chemical information, help you interpret the information you find, & improve your ability to summarize and present that information. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4610. Term offered: fall, spring. Repeatable. Max Hours: 2 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs
CHEM 5630 - Programming for Data Analysis in the Physical Sciences (1 Credit)
This course will be taught using live coding format (the instructor will code live in the classroom with the students). In this course, you will learn to process data using Python scripts that you will write. Data include for example absorption spectra, protein pdb files, coordinate files. You will also learn how to use Python libraries and write functions (for example to create high resolution graphs). Finally, you will learn best coding practices, how to keep track of different versions of your code and share your code using Github. Restriction: Restricted to students enrolled degree-granting graduate programs. Cross-listed with CHEM 4630. Max hours: 1 Credit.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5655 - Teaching Assistant Bootcamp (1 Credit)
This course is 4-5 8-hour days of intensive training in suitable pedagogy for general chemistry and organic chemistry laboratory classes, procedures for teaching laboratory sections, and laboratory techniques. Students must have a teaching assistant contract with the Chemistry Department in order to take this course. Restriction: Restricted to degree-granting graduate programs. Cross-listed with CHEM 4655. Term offered: fall. Max hours: 1 Credit.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5700 - Environmental Chemistry (3 Credits)
A discussion of the sources, reactions, transport, effects, and fates of chemical species in the water, soil and air environments. Requisite knowledge in Undergraduate Organic and Analytical Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Cross-listed with CHEM 4700. Term offered: spring. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5810 - Graduate Biochemistry I (4 Credits)
Topics include proteins, mechanisms and kinetics of enzymes, carbohydrates, lipids and membranes, nucleic acids, genetic engineering, signaling pathways, and energetics, which are integrated with critical analysis of recent journal papers, culminating in written and seminar presentations of individual projects. Continuation of 5810. Prerequisite: CHEM 5810 with a B- or higher. Restriction: Restricted to degree-granting Graduate programs or permission of instructor. Term offered: spring. Max hours: 4 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5830 - Graduate Biochemistry II (4 Credits)
Topics include biosynthesis & metabolism of carbohydrates, lipids& amino acids, & genetic information flow of DNA replication, transcription, translation& regulation of transcription, which are integrated with critical analysis of recent literature, culminating in written& seminar presentations of individual projects. Typically Offered: Spring.

CHEM 5835 - Biochemistry of Metabolic Disease (3 Credits)
Explores the biochemical and molecular aspects of cancer biology. Topics include DNA mutations and repair, gene regulation, oncogenes and tumor suppressors, stem cells and differentiation, and cancer drug development. Restriction: Restricted to degree-granting graduate programs. Cross-listed with CHEM 4835, BIOL 4835, and BIOL 5835. Max Hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5840 - Independent Study (1-3 Credits)
Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Repeatable. Max Hours: 9 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5845 - Molecular Modeling and Drug Design (3 Credits)
Advanced course in biochemistry. An introductory course on modern molecular modeling techniques and their applications to computer-aided rational drug design. Restriction: Gradate standing. Cross-listed with CHEM 4845. Term offered: fall. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5850 - Bioinorganic Chemistry: Bioinorganic compounds in medicine (3 Credits)
Explore the roles of metals in biochemistry and medicine by studying chemical/physical properties of metal coordinated compounds. The course focus on metal coordination resulting biopolymer folding and the function of macromolecules that is involved into iron cytochromes, zinc and copper enzymes, iron sulfur proteins, oxygen transport, iron storage, electron transfer, inorganic model compounds, metals in medicine, and toxicity of inorganic species. Topic is extended to biomedical application such as chemotherapy. Prerequisite: CHEM 3810 or CHEM 4810 or CHEM 5810 with a C- or higher. Cross-listed with CHEM 4860. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 5860 - Bioinorganic Chemistry: Bioinorganic compounds in medicine (3 Credits)
CHEM 5880 - Directed Research (1-6 Credits)
Students will engage in original research projects supervised and mentored by faculty. Students must work with faculty prior to registration to develop a proposal for their project and receive permission to take this course. Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments, and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Repeatable. Max Hours: 6 Credits.
Grading Basis: Letter Grade

CHEM 5939 - Internship (1-6 Credits)
Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments, and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Repeatable. Max Hours: 9 Credits.
Grading Basis: Letter Grade
Repeatable. Max Credits: 9.

CHEM 5950 - Master's Thesis (1-8 Credits)
Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments, and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Max hours: 8 Credits.
Grading Basis: Letter Grade with IP
Additional Information: Report as Full Time.

CHEM 6000 - Chemistry Seminar (1-3 Credits)
Faculty and student presentations of CU-Denver research projects and other current chemistry topics. Note: All chemistry students are encouraged to attend, but credit is given only to those who present seminars. Requisite knowledge in Undergraduate Physical or Environmental Chemistry is assumed. Restriction: Restricted to degree-granting Graduate programs. Term offered: fall, spring, summer. Max hours: 3 Credits.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 6001 - Master's Research Seminar (1 Credit)
Students present a formal seminar to the department describing their master's research work. Note: Required for all students completing a thesis-based master's degree; optional for those completing master's projects. Prereq: CHEM 6000 with a B- or higher. Term offered: fall, spring, summer. Max hours: 1 Credit.
Grading Basis: Letter Grade
Prereq: CHEM 6000 with a B- or higher

CHEM 6002 - Chemistry Seminar I (1 Credit)
The art of listening to and giving a chemistry seminar. Introduces the chemical literature, the pedagogical techniques of seminar giving, and the critical thinking skills required to understand a technical presentation. Note: Seminar presentations by faculty, outside speakers, and advanced graduate students are analyzed by the students participating in the course. Restriction: Restricted to degree-granting Graduate programs. Max Hours: 1 Credit.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 6003 - Chemistry Seminar II (1 Credit)
Students prepare and give a chemical seminar based on a literature paper. Note: Seminar presentations by students and outside speakers are analyzed by students in the course. Restriction: Restricted to degree-granting Graduate programs. Max Hours: 1 Credit.
Grading Basis: Letter Grade
Restriction: Restricted to degree-granting graduate programs

CHEM 6840 - Independent Study: CHEM (1-6 Credits)
Repeatable. Max Hours: 9 Credits.
Grading Basis: Letter Grade
Repeatable. Max Credits: 9.

CHEM 6950 - Master's Thesis (1-6 Credits)
Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments, and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Max hours: 6 Credits.
Grading Basis: Letter Grade with IP
Additional Information: Report as Full Time.

CHEM 6960 - Master's Report (1-6 Credits)
Note: Students must submit a special processing form completely filled out and signed by the student and faculty member, describing the course expectations, assignments, and outcomes, to the Graduate School for approval. Term offered: fall, spring, summer. Repeatable. Max hours: 6 Credits.
Grading Basis: Letter Grade with IP
Additional Information: Report as Full Time.