COLLEGE OF NATURAL AND APPLIED SCIENCES

CHEMISTRY PROGRAM

PROSPECTUS

The Chemistry major and minor programs are designed to prepare students for:

1. graduate work in chemistry;
2. admission to medical, dental, pharmacy, and veterinary schools;
3. employment in laboratory-oriented positions in government and industry; and
4. teaching secondary school chemistry, provided teaching certification requirements of the School of Education are fulfilled.

The Chemistry Program also provides course offerings in chemistry required by major programs in agriculture, biology, engineering, nursing, and other health-related sciences.

The small class sizes allow students to get close supervision and more hands-on training. Students can gain unique research experience through internship opportunities at UOG's Water & Environmental Research Institute, Marine Laboratory, and Crime Lab. The Chemistry Program curriculum is also closely aligned to the American Chemical Society standards.

LEARNING OUTCOMES

1. Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:
   a. Students should be able to explain the scientific method and relate its application to chemical discoveries.
   b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.
   c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.
   d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.
2. Demonstrate the skills to make observations, conduct experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:
   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.
   b. Students will synthesize, isolate, purify, and characterize a series of compounds using modern methods.
   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.
   d. Students will be able to design an experimental procedure.
   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.
3. Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using

computer, written and oral communication skills with the following:

a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.
b. Students will effectively communicate scientific information through oral presentations.
c. Students will use computer technology to gather, process, analyze, and present chemical data.
d. Students will use chemical literature and computer resources to gather research information.

4. Demonstrate critical thinking, problem-solving skills, and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:
   a. Students should be able to describe the structure and composition of matter.
   b. Students should be able to solve qualitative and quantitative problems.
   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.
   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.
   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.
5. Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:
   a. Students should be able to use modern analytical instrumentations.
   b. Students should be able to interpret data and relate these to chemical structure and properties.
   c. Students should be able to relate the application of instrumentation to industries.
   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.
6. Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:
   a. Students will use chemical literature and computer resources to gather research information.
   b. Students should be able to critically evaluate scientific information.
   c. Students should be able to develop research project and design experimental approach.
7. Demonstrate interaction skills and teamwork with the following objectives:
   a. Students should be able to work cooperatively in problem solving exercise.
   b. Students should be able to exercise leadership skills in teamwork.
8. Students should demonstrate adequate interpersonal communication skills.

TRACKS

CHEMISTRY TRACKS

The Chemistry Program offers four tracks under two degrees:

Bachelor of Science in Chemistry

- Chemistry: This track is tailored for students planning to pursue graduate studies in chemistry, physics, and chemical engineering. This track would also be ideal for those who seek employment in industry upon graduation.
- Chemistry Pre-Pharmacy: This track is primarily tailored for those planning to pursue a pharmacy degree.
- Chemistry-Biology Dual Degree: This track is tailored for those who are planning to pursue medicine and graduate studies in biomedical sciences.

Bachelor of Arts in Chemistry with Teaching Emphasis

- Chemistry Teaching: This track is tailored for those who are going to teach at high school level.

CHEMISTRY MINOR

Students planning to pursue graduate studies in biological and agricultural sciences can benefit with a minor in Chemistry. Students who plan to teach science at the high school level can also benefit with a minor in Chemistry.

DEGREE REQUIREMENTS

MAJOR REQUIREMENTS

It is very important for new and transfer students who elect Chemistry as a major to contact the Chemistry major program advisor for advisement immediately after declaring this major.

It is recommended that Chemistry majors planning to pursue graduate work in chemistry have adequate experience in research, and the Chemistry Program has courses to help meet this requirement. Having a clear goal of a particular area of interest is also important, and discussions with your advisor and other Chemistry faculty are essential in this process. It is important to focus on identifying and getting into a graduate program that aligns with your career goals and need. Courses in applied mathematics and computer science and as many upper division courses in chemistry and physics as the student's schedule will permit are also highly recommended.

CHEMISTRY TRACK (68-69 CREDIT HOURS)

Required Courses (63-64 credit hours)

Course	Course Title	Credits	Term Offered
CH102	GENERAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH102L	GENERAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH103	GENERAL CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH103L	GENERAL CHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH310A	ORGANIC CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH310B	ORGANIC CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH311	BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	FALL ONLY/ ALL YEARS
CH312	LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	SPRING ONLY/ ALL YEARS
CH330	QUANTITATIVE ANALYSIS	3	FALL ONLY/ ODD YEARS
CH330L	QUANTITATIVE ANALYSIS LABORATORY	2	FALL ONLY/ ODD YEARS
CH410	INSTRUMENT METHODS OF ANALYSIS	3	SPRING ONLY/ EVEN YEARS

Course	Course Title	Credits	Term Offered
CH410L	INSTRUMENT MTHDS OF ANALYS LAB	2	SPRING ONLY/ EVEN YEARS
CH450A	PHYSICAL CHEMISTRY	4	FALL ONLY/ EVEN YEARS
CH450B	PHYSICAL CHEMISTRY	4	SPRING ONLY/ ODD YEARS
CH451	PHYSICAL CHEMISTRY I LABORATORY	2	SPRING ONLY/ ODD YEARS
CH491	CHEMISTRY SEMINAR	1 - 2	FALL/SPRING/ ALL YEARS
MA203	CALCULUS I	5	FALL/SPRING/ ALL YEARS
MA204	CALCULUS II	5	FALL/SPRING/ ALL YEARS
MA205	MULTIVARIABLE CALCULUS	4	FALL/SPRING/ ALL YEARS
PH210	INTRODUCTORY PHYSICS LABORATORY	1	FALL ONLY/ ALL YEARS
PH211	INTRODUCTORY PHYSICS LABORATORY	1	SPRING ONLY/ ALL YEARS
PH251	UNIVERSITY PHYSICS	4	FALL ONLY/ ALL YEARS
PH252	UNIVERSITY PHYSICS	4	SPRING ONLY/ ALL YEARS

Elective Courses (5 credit hours)

Any upper division Chemistry (CH) courses or program-approved courses.

CHEMISTRY PRE-PHARMACY TRACK (86-88 CREDIT HOURS)

Required Courses (82-84 credit hours)

Course	Course Title	Credits	Term Offered
CH102	GENERAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH102L	GENERAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH103	GENERAL CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH103L	GENERAL CHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH310A	ORGANIC CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH310B	ORGANIC CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH311	BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	FALL ONLY/ ALL YEARS
CH312	LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	SPRING ONLY/ ALL YEARS
CH330	QUANTITATIVE ANALYSIS	3	FALL ONLY/ ODD YEARS
CH330L	QUANTITATIVE ANALYSIS LABORATORY	2	FALL ONLY/ ODD YEARS
CH350	FOUNDATIONS OF PHYSICAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH350L	FOUNDATIONS OF PHYSICAL	1	FALL ONLY/ ALL YEARS

Course	Course Title	Credits	Term Offered
	CHEMISTRY LABORATORY		
CH419	BIOCHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH419L	BIOCHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH491	CHEMISTRY SEMINAR	1 - 2	FALL/SPRING/ ALL YEARS
BI124	HUMAN ANATOMY AND PHYSIOLOGY I	3	FALL ONLY/ ALL YEARS
BI124L	HUMAN ANATOMY & PHYSIOLOGY I LABORATORY	1	FALL ONLY/ ALL YEARS
BI125	HUMAN ANATOMY & PHYSIOLOGY II	3	SPRING ONLY/ ALL YEARS
BI125L	HUMAN ANATOMY & PHYSIO II LABORATORY	1	SPRING ONLY/ ALL YEARS
BI157	PRINCIPLES OF BIOLOGY I	3	SPRING ONLY/ ALL YEARS
BI157L	PRINCIPLES OF BIOLOGY I LABORATORY	1	SPRING ONLY/ ALL YEARS
BI158	PRINCIPLES OF BIOLOGY II	3	FALL ONLY/ ALL YEARS
BI158L	PRINCIPLES OF BIOLOGY II LABORATORY	1	FALL ONLY/ ALL YEARS
BI225	BASIC MICROBIOLOGY	3	FALL ONLY/ ALL YEARS
BI225L	BASIC MICROBIOLOGY LABORATORY	1	FALL ONLY/ ALL YEARS

Course	Course Title	Credits	Term Offered
BI315	GENERAL GENETICS	3	FALL ONLY/ ALL YEARS
BI315L	GENERAL GENETICS LABORATORY	1	FALL ONLY/ ALL YEARS
BI416	CELLULAR & MOLECULAR BIOLOGY	3	SPRING ONLY/ ALL YEARS
BI416L	CELLULAR & MOLECULAR BIOLOGY LABORATORY	1	SPRING ONLY/ ALL YEARS
MA203	CALCULUS I	5	FALL/SPRING/ ALL YEARS
PH210	INTRODUCTORY PHYSICS LABORATORY	1	FALL ONLY/ ALL YEARS
PH211	INTRODUCTORY PHYSICS LABORATORY	1	SPRING ONLY/ ALL YEARS
PH251	UNIVERSITY PHYSICS	4	FALL ONLY/ ALL YEARS
PH252	UNIVERSITY PHYSICS	4	SPRING ONLY/ ALL YEARS
NU207B	PHARMACOLOGY IN NURSING	2	SPRING ONLY/ ALL YEARS

Choice of (5-6 credit hours):

Course	Course Title	Credits	Term Offered
MA161A	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA161B	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA165	PRECALCULUS	5	FALL/SPRING/ ALL YEARS

Elective Courses (4 credit hours)

Any upper division Chemistry (CH) or Biology (BI) courses.

General Education (Recommended Courses)

Course	Course Title	Credits	Term Offered
CT101	CRITICAL THINKING	3	FALL/SPRING/ ALL YEARS
PY101	GENERAL PSYCHOLOGY	3	FALL/SPRING/ ALL YEARS
SO101	INTRODUCTION TO SOCIOLOGY	3	FALL/SPRING/ ALL YEARS
BA110	PRINCIPLES OF ECONOMICS	3	FALL/SPRING/ ALL YEARS
EN110	FRESHMAN COMPOSITION	3	FALL/SPRING/ ALL YEARS
EN111	WRITING FOR RESEARCH	3	FALL/SPRING/ ALL YEARS
CO210	FUNDAMENTALS OF COMMUNICATION	3	FALL/SPRING/ ALL YEARS
MA151	INTRODUCTORY STATISTICS	3	FALL/SPRING/ ALL YEARS

CHEMISTRY TEACHING TRACK (78-82 CREDIT HOURS)

Required Courses (69-73 credit hours)

Course	Course Title	Credits	Term Offered
CH102	GENERAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH102L	GENERAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH103	GENERAL CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH103L	GENERAL CHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH310A	ORGANIC CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH310B	ORGANIC CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH311	BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	FALL ONLY/ ALL YEARS
CH312	LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	SPRING ONLY/ ALL YEARS
CH330	QUANTITATIVE ANALYSIS	3	FALL ONLY/ ODD YEARS
CH330L	QUANTITATIVE ANALYSIS LABORATORY	2	FALL ONLY/ ODD YEARS
CH350	FOUNDATIONS OF PHYSICAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH350L	FOUNDATIONS OF PHYSICAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH392	LABORATORY TEACHING AND ASSISTING	1 - 3	FALL/SPRING/ ALL YEARS
CH491	CHEMISTRY SEMINAR	1 - 2	FALL/SPRING/ ALL YEARS
BI100	ENVIRONMENTAL BIOLOGY	3	FALL/SPRING/ ALL YEARS
BI100L	ENVIRONMENTAL BIOLOGY LABORATORY	1	FALL/SPRING/ ALL YEARS
BI157	PRINCIPLES OF BIOLOGY I	3	SPRING ONLY/ ALL YEARS
BI157L	PRINCIPLES OF BIOLOGY I LABORATORY	1	SPRING ONLY/ ALL YEARS
BI158	PRINCIPLES OF BIOLOGY II	3	FALL ONLY/ ALL YEARS
BI158L	PRINCIPLES OF BIOLOGY II LABORATORY	1	FALL ONLY/ ALL YEARS
MA203	CALCULUS I	5	FALL/SPRING/ ALL YEARS
PH210	INTRODUCTORY PHYSICS LABORATORY	1	FALL ONLY/ ALL YEARS
PH211	INTRODUCTORY PHYSICS LABORATORY	1	SPRING ONLY/ ALL YEARS
PH251	UNIVERSITY PHYSICS	4	FALL ONLY/ ALL YEARS
PH252	UNIVERSITY PHYSICS	4	SPRING ONLY/ ALL YEARS
NS110	INTRODUCTION TO THE EARTH	3	AS REQUIRED

Course	Course Title	Credits	Term Offered
NS110L	INTRODUCTION TO THE EARTH LABORATORY	1	AS REQUIRED

Choice of (5-6 credit hours):

Course	Course Title	Credits	Term Offered
MA161A	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA161B	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA165	PRECALCULUS	5	FALL/SPRING/ ALL YEARS

Choice of (4 credit hours):

Course	Course Title	Credits	Term Offered
NS112	HISTORY OF THE EARTH	3	AS REQUIRED
NS112L	HISTORY OF THE EARTH LABORATORY	1	AS REQUIRED
GE203	PRINCIPLES OF PHYSICAL GEOGRAPHY	4	SPRING ONLY/ ALL YEARS

Elective Courses (9 credit hours)

Five credit hours of any upper division Chemistry (CH) courses and any four credit hours of upper division science (Agriculture & Life Sciences, Biology, Mathematics, Physics) courses.

CHEMISTRY/BIOLOGY DUAL DEGREE TRACK (93-94 CREDIT HOURS)

Required Courses (84-85 credit hours)

Course	Course Title	Credits	Term Offered
CH102	GENERAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH102L	GENERAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH103	GENERAL CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH103L	GENERAL CHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH310A	ORGANIC CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH310B	ORGANIC CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH311	BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	FALL ONLY/ ALL YEARS
CH312	LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	SPRING ONLY/ ALL YEARS
CH330	QUANTITATIVE ANALYSIS	3	FALL ONLY/ ODD YEARS
CH330L	QUANTITATIVE ANALYSIS LABORATORY	2	FALL ONLY/ ODD YEARS
CH350	FOUNDATIONS OF PHYSICAL CHEMISTRY	3	FALL ONLY/ ALL YEARS

Course	Course Title	Credits	Term Offered
CH350L	FOUNDATIONS OF PHYSICAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH410	INSTRUMENT METHODS OF ANALYSIS	3	SPRING ONLY/ EVEN YEARS
CH410L	INSTRUMENT MTHDS OF ANALYS LAB	2	SPRING ONLY/ EVEN YEARS
CH419	BIOCHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH419L	BIOCHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH491	CHEMISTRY SEMINAR	1 - 2	FALL/SPRING/ ALL YEARS
BI157	PRINCIPLES OF BIOLOGY I	3	SPRING ONLY/ ALL YEARS
BI157L	PRINCIPLES OF BIOLOGY I LABORATORY	1	SPRING ONLY/ ALL YEARS
BI158	PRINCIPLES OF BIOLOGY II	3	FALL ONLY/ ALL YEARS
BI158L	PRINCIPLES OF BIOLOGY II LABORATORY	1	FALL ONLY/ ALL YEARS
BI225	BASIC MICROBIOLOGY	3	FALL ONLY/ ALL YEARS
BI225L	BASIC MICROBIOLOGY LABORATORY	1	FALL ONLY/ ALL YEARS
BI310	EVOLUTION	3	SPRING ONLY/ ALL YEARS
BI315	GENERAL GENETICS	3	FALL ONLY/ ALL YEARS
BI315L	GENERAL GENETICS LABORATORY	1	FALL ONLY/ ALL YEARS
BI410	ECOLOGY	3	SPRING ONLY/ ALL YEARS
BI410L	ECOLOGY LABORATORY	2	SPRING ONLY/ ALL YEARS
BI412	BIOMETRICS	3	FALL ONLY/ ALL YEARS
BI412L	BIOMETRICS LABORATORY	1	FALL ONLY/ ALL YEARS
BI416	CELLULAR & MOLECULAR BIOLOGY	3	SPRING ONLY/ ALL YEARS
BI416L	CELLULAR & MOLECULAR BIOLOGY LABORATORY	1	SPRING ONLY/ ALL YEARS
MA203	CALCULUS I	5	FALL/SPRING/ ALL YEARS
PH210	INTRODUCTORY PHYSICS LABORATORY	1	FALL ONLY/ ALL YEARS
PH211	INTRODUCTORY PHYSICS LABORATORY	1	SPRING ONLY/ ALL YEARS
PH251	UNIVERSITY PHYSICS	4	FALL ONLY/ ALL YEARS
PH252	UNIVERSITY PHYSICS	4	SPRING ONLY/ ALL YEARS

Elective Courses (9 credit hours)

Five credit hours of upper division Chemistry (CH) courses and any four credit hours of upper division Biology (BI) courses.

MINOR REQUIREMENTS

CHEMISTRY MINOR (33-35 CREDIT HOURS)

Required Courses (29-31 credit hours)

Course	Course Title	Credits	Term Offered
CH102	GENERAL CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH102L	GENERAL CHEMISTRY LABORATORY	1	FALL ONLY/ ALL YEARS
CH103	GENERAL CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH103L	GENERAL CHEMISTRY LABORATORY	1	SPRING ONLY/ ALL YEARS
CH310A	ORGANIC CHEMISTRY	3	FALL ONLY/ ALL YEARS
CH310B	ORGANIC CHEMISTRY	3	SPRING ONLY/ ALL YEARS
CH311	BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	FALL ONLY/ ALL YEARS
CH312	LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY	2	SPRING ONLY/ ALL YEARS
CH330	QUANTITATIVE ANALYSIS	3	FALL ONLY/ ODD YEARS
CH330L	QUANTITATIVE ANALYSIS LABORATORY	2	FALL ONLY/ ODD YEARS
CH491	CHEMISTRY SEMINAR	1 - 2	FALL/SPRING/ ALL YEARS

Choice of (5-6 credit hours):

Course	Course Title	Credits	Term Offered
MA161A	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA161B	COLLEGE ALGEBRA AND TRIGONOMETRY	3	FALL/SPRING/ ALL YEARS
MA165	PRECALCULUS	5	FALL/SPRING/ ALL YEARS

Elective Courses (4 credit hours)

Any upper division Chemistry (CH) course(s).

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