Chemistry today is a large and complex field. Beyond the more traditional sub-disciplines of organic, inorganic, physical, and analytical chemistry, the study of chemistry at the university level will also introduce you to materials science, polymers, biochemistry and molecular biology, biotechnology, environmental chemistry, and pharmaceutical and medicinal chemistry.

At The University of Memphis, you can choose two degree options in chemistry: a B.S., with a Chemistry Major; or a B.S. Chem., for those students preparing for careers as professional chemists intending to pursue advanced degrees in Chemistry. The latter meets the requirements of the Committee on Professional Training of the American Chemical Society. A concentration in biochemistry is also an option with both degrees.

What does a typical selection of courses look like?

After you have completed introductory courses and labs in general, inorganic, and organic chemistry, you can continue in more advanced work in those areas, and you can also explore topics such as: Quantitative Chemical Analysis, Physical Chemistry, Environmental Chemistry, Computational Chemistry, Organic Medicinal Chemistry, Biochemistry, and Instrumental Methods.

What other opportunities can you enjoy as a student in Chemistry?

- Working closely with faculty on research problems of mutual interest
- Attending weekly departmental lectures by University of Memphis faculty and outside research experts
- Joining the University of Memphis Student Affiliates chapter of the American Chemical Society, which meets regularly and will help you meet your peers, keep up to date on developments in the field, and learn more about career possibilities after graduation
- Receiving specialized guidance if you are considering a pre-health field, from the Pre-Health Advisor, Ms. Jessica Kelso, in Scates Hall 107 (jgclffrd@memphis.edu), http://www.memphis.edu/cas/pre_health/index.php
- Scholarship opportunities: a number of scholarships are available to students pursuing undergraduate programs in Chemistry
CHEMISTRY
SAMPLE FOUR-YEAR PLAN [General Concentration]

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGL 1010</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1110/1111</td>
<td>4</td>
</tr>
<tr>
<td>GE Humanities/Fine Arts</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1910</td>
<td>4</td>
</tr>
<tr>
<td>Elective (ACAD 1100)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Semester Totals**

17 hrs. 14 hrs.

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>CHEM 3310/3301</td>
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</tr>
<tr>
<td>COMM 2381</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 2110/2111**</td>
<td>4</td>
</tr>
<tr>
<td>GE Humanities/Fine Arts</td>
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</table>

**Semester Totals**

14 hrs. 17 hrs.

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHEM 3201/3211</td>
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<tr>
<td>MATH*</td>
<td>3</td>
</tr>
<tr>
<td>GE History</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
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</table>

**Semester Totals**

14 hrs. 15 hrs.

**Senior Year**

<table>
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<th>Course</th>
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<tr>
<td>UD Elective</td>
<td>3</td>
</tr>
<tr>
<td>UD CHEM</td>
<td>4</td>
</tr>
</tbody>
</table>

**Semester Totals**

16 hrs. 13 hrs.

*One of MATH 2110, MATH 4611, or COMP 4001

**With permission of the Chair of the Chemistry Department, PHYS 2010/2011 and 2020/2021 may be substituted for this sequence.

*** One of the following may be selected: PHIL 3512, 3514, or 3515.

GE = General Education Requirements  BS = Bachelor of Science college requirements  UD = Upper division

Foreign Language Requirement – See the Undergraduate Catalog: http://catalog.memphis.edu

Degree hours = 120  42 Upper Division hours required for graduation

No more than 2 hours of physical education courses may be counted toward a degree.

Residence – 30 of the last 60 hours must be taken at University of Memphis; at least 60 hours must be at a four-year institution; transfer students must earn at least 6 hours of a major at UM and at least 3 hours of a minor at UM.
CHEMISTRY COURSE DESCRIPTIONS

CHEM 1010 - Chemistry of Materials. Fundamental laws of chemistry and impact of chemistry on modern society.
CHEM 1011 - Chemistry of Materials Lab. Experiments and experimental techniques in general and inorganic chemistry.
CHEM 1021 - Chemistry of Life Lab. Experiments and experimental techniques in organic and biochemistry.
CHEM 1100 - Prep General Chemistry. For students whose curriculum requires CHEM 1110 but who have inadequate background.
CHEM 1110 - General Chemistry I.
CHEM 1111 - General Chemistry I Lab. Experiments and experimental techniques in general chemistry.
CHEM 1120 - General Chemistry II.
CHEM 1121 - General Chemistry II Lab. Continuation of CHEM 1111.
CHEM 3111 - Foundations/Inorganic CHEM. Theoretical and applied inorganic chemistry.
CHEM 3201 - Foundation/Analytical CHEM lab.
CHEM 3211 - Foundations/Analytical CHEM. Theory and practice of modern chemical analysis.
CHEM 3301 - Foundations/Organic CHEM Lab.
CHEM 3310 - Foundations/Organic Chemistry. Study of structures, physical properties, reactivity of organic compounds.
CHEM 3411 - Foundations/Physical Chemistry. Fundamentals of thermodynamics and kinetics and their applications in chemical and biological systems; selected topics in the areas of surface chemistry, spectroscopy and macromolecules.
CHEM 3501 - Foundation/Bioorganic CHEM lab. Computational and experimental studies of concentrations, structures and functions of biomolecules, including amino acids, proteins, carbohydrates, lipids, and nucleic acids.
CHEM 3511 - Foundations/Bioorganic CHEM. Systematic study of structure of biomolecules, including amino acids, proteins, carbohydrates, lipids and nucleic acids; emphasis on functional consequences.
CHEM 4001 - Environmental Chemistry. Chemical phenomena occurring in soil, atmospheric and aquatic environments; consideration of natural resources and energy.
CHEM 4111 - Intermediate Inorganic CHEM. Theoretical and applied inorganic chemistry.
CHEM 4211 - Instrumental Analysis. Topics in modern analytical instrumental analysis.
CHEM 4315 - Organic Medicinal Chem. Introduction to principles of medicinal chemistry.
CHEM 4406 - Molecular Spectroscopy Lab.
CHEM 4411 - Advanced Physical Chem. Advanced topics in physical chemistry; statistical mechanics and statistical thermodynamics plus selected topics in the areas of kinetic theory of gases, condensed phases, and non-equilibrium processes.
CHEM 4414 – Quantum Mechanics/Spectroscopy. A study of theoretical chemistry, chemical physics, theoretical molecular spectroscopy and solid-state chemistry.
CHEM 4416 - Molecular Spectroscopy. Theory, instrumentation and applications of NMR, FT-IR, mass spectrometry, and UV-visible spectroscopy.
CHEM 4501 - Lab Tech In Biochem. Biochemical techniques, analysis and design strategies.
CHEM 4511 - Biochemistry I. Chemistry of amino acids and proteins related to their properties in biochemical systems.
CHEM 4512 - Biochemistry II. Continuation of CHEM 4511.
CHEM 4603 - Materials Synthesis Lab. Practical application of modern chemical synthesis.
CHEM 4604 - Instrumental Methods. Analytical instrumental techniques including molecular spectroscopy, chromatography, atomic spectroscopy, and electrochemical analysis.
CHEM 4613 - Materials Synthesis. Principles, methods and applications of modern chemical synthesis.
CHEM 4614 - Polymer Chemistry. Fundamental concepts in polymer chemistry and polymer physics.
CHEM 4615 - Biophysical Chemistry. Study of biomolecular structures and properties.
CHEM 4901 - Chemical Research I. Introduction to basic research; collaboration with faculty on problem of mutual interest.
CHEM 4902 - Chemical Research II. Continuation of basic research.
CHEM 4903 - Chemical Research III. Completion of research project.
CHEM 4916 - Teaching Chemistry Laboratory. Preparing for and conducting instruction in introductory chemistry laboratories.
CHEM 4918 - Chemistry Practicum. Hands-on experience of chemistry in a commercial, medical, or private laboratory setting.
CHEM 4999. Senior survey. Capstone course for chemistry majors.

Please consult the Undergraduate Catalog at http://catalog.memphis.edu for complete descriptions.

The University of Memphis http://www.memphis.edu
The College of Arts and Sciences http://www.memphis.edu/cas

Career Services http://www.memphis.edu/careerservices

The University of Memphis is an Equal Opportunity/Affirmative Action University. It is committed to education of a non-racially identifiable student body.
CHEMISTRY PROGRAM REQUIREMENTS

A. University General Education Program (41 hours)
See the Undergraduate Catalog for the University General Education Program requirements.

B. The Major (46-53 hours)
Students must earn a grade of at least “C-” in all CHEM courses applied toward the major or minor, and in all required BIOL, PHYS, and MATH courses. Students must earn a grade of at least “C-” in CHEM 1110 and CHEM 1120 before enrolling in any upper-division CHEM course, and in CHEM 1111 and CHEM 1121 before enrolling in any upper-division CHEM laboratory course.

1. Core requirements (23 hours): CHEM 1110/1111, 1120/1121, CHEM 3111, 3201/3211, 3301/3310, 3411, 3511/3511, 4999, PHYS 2110/2111, 2120/2121 or 2010/2011, 2020/2021 and one of the following upper division ethics courses: PHIL 3512, 3514, 3515.

2. Plus (15-22 hours):
   a. General concentration: Eight (8) upper division semester hours in chemistry not to include more than three credit hours of experiential learning (CHEM 4901/4902/4903, CHEM 4916 or CHEM 4918), MATH 1910 (this course is included in the University General Education Program requirements); MATH 1920; and one of the following courses: MATH 2110, 4611, or COMP 1900.
   OR
   b. Biochemistry concentration: MATH 1830 or 1910 (included in the University General Education Program requirements), MATH 4611, CHEM 4511/4501, BIOL 1110/1111, 1120/1121, one of the following: CHEM 4512, BIOL 3500 or 3130, and three additional upper division hours in CHEM.

C. Electives
Electives may be chosen to bring the total number of hours to 120.

Chemistry Major (B.S. Ch.)
A. The Major (52-54 hours)
1. Core requirements (38-39 hours):
   Completion of CHEM 1110/1111, 1120/1121, CHEM 3111, 3201/3211, 3301/3310, 3411, 3511/3501, 4999; PHYS 2110/2111, 2120/2121 (strongly recommended), or 2010/2011, 2020/2021, MATH 1910 (included in the University General Education Program requirements), MATH 1920; and one of the following upper division ethics courses: PHIL 3512, 3514, 3515
2. Advanced requirements (17-32 hours)
   Either:
   a. General concentration: Nine (9) upper division semester hours in chemistry lecture courses, two upper division chemistry laboratory courses, the undergraduate research course sequence CHEM 4901/4902/4903, and one of the following courses: MATH 2110, 2120, 4611, 4635, or COMP 1900.
   OR
   b. Biochemistry concentration: BIOL 1110/1111, BIOL 1120/1121, CHEM 4511, CHEM 4501, six (6) additional upper division hours in chemistry lecture courses, one additional upper division chemistry laboratory course, the undergraduate research course sequence CHEM 4901/4902/4903, one of MATH 4611 or 4635, and one of BIOL 3130, 3500, or CHEM 4512.

B. Electives
Electives may be chosen to bring the total number of hours to 120.

Chemistry Minor
Completion of 20 semester hours in chemistry courses, including CHEM 1110/1111, 1120/1121, the remaining semester hours must be selected from upper division chemistry courses and include at least two chemistry laboratory courses.

Graduating with Honors in Chemistry
Applies to both the B.S.Ch. and the B.S. with a major in Chemistry
1. In order to graduate with Honors in Chemistry, the student must have an overall GPA of 3.25 and a GPA of 3.25 in all science and mathematics courses required for the major.
2. The student must earn honors credit in a minimum of three 3-credit hour upper-division chemistry lecture courses if honors have not been previously earned in CHEM 1110/1120, or in a minimum of two 3-credit hour upper-division chemistry lecture courses if honors have been previously earned in CHEM 1110/1120. Honors may be contracted in courses not offering a formal Honors section. A minimum grade of B is required in order to earn honors credit.
3. The student must successfully complete CHEM 4901/2/3 with a formal paper required in CHEM 4903 serving as the equivalent of an honors thesis.
4. The student must present his/her research to an audience external to the Department of Chemistry.

For more information, please contact:
The Department of Chemistry
http://www.memphis.edu/chem/  Chair: Dr. Gary Emmert
gemmert@memphis.edu
Smith Hall 213; 901-678-2621
Undergraduate Advisor: Dr. Peter Bridson  pbridson@memphis.edu  (901) 678-4423