Chemistry (CHEM)

Head of the Department: Professor Munchausen
Professors: Corkern, Holmes, Shaw
Associate Professors: Elbers, Parkinson
Assistant Professors: Barghougthi, Blanchard, Hilliard, Hufstetler, Manivannan, McCarthy,
Norwood, Poche, Robertson, Wurm, Zurales
Instructors: Adams, Allen, May, Moore, Musa, Self

Corresponding lecture and laboratory courses numbered below 400 must be scheduled
concurrently unless prior credit has been received for either the lecture or the laboratory.
Degree credit will not be granted for corresponding lecture and laboratory courses numbered
below 400 until both lecture and laboratory courses have been successfully completed unless
permission to do otherwise has been obtained from the Department Head. Such permission will
be granted only in unusual circumstances.
Students who violate the laboratory safety policy of the Department are subject to dismissal
from the laboratory and withdrawal from the course.
Degree credit will be awarded for only one of the Chemistry courses in each of the following
combinations: 101-106-121, 102-122, 103-123, 104-124, 261-265, 263-267, 281-481, 283-483.
Degree credit will be awarded for only one of the Physics courses in each of the following
combinations: 142-191-221, 192-222, 193-223, 194-224.

Chemistry (CHEM)

101. General Chemistry. Credit 3 hours. Prerequisites: An Enhanced ACT standard score in
Mathematics of 18 or greater or completion of or registration for Mathematics 160 or 161
and registration for or prior credit for Chemistry 103. A course in the fundamentals of

chemistry designed primarily for students in Nursing and applied sciences . This course
is not recommended for students whose curricula require Chemistry 251, 253, 254 and courses
numbered above 300.

102. General Chemistry. Credit 3 hours. Prerequisites: Chemistry 101-103 and registration
for or prior credit for Chemistry 104. A continuation of Chemistry 101. General inorganic
chemistry with selected topics in organic chemistry. This course is not recommended for
students whose curricula require Chemistry 251, 253, 254 and courses numbered above 300.

103. General Chemistry Laboratory. Credit 1 hour. Prerequisite: Registration for or prior
credit for Chemistry 101. A series of laboratory experiments designed to illustrate the
material studied in Chemistry 101 and give the student an introduction to the experimental
techniques of chemistry. Two hours of laboratory a week. Laboratory fee: $15.00.

104. General Chemistry Laboratory. Credit 1 hour. Prerequisite: Registration for or prior
credit for Chemistry 102. A continuation of Chemistry 103. Two hours of laboratory a week.
Laboratory fee: $15.00.

105.1 Forensic Science. Credit 4 hours. Scientific aspects of law enforcement; role and functions
of the crime laboratory. This course may not be used to satisfy the General Education sequence
requirement in the Natural Sciences. Course consists of four hours of lecture and demonstrations
a week.

106.1 Chemistry for the Consumer. Credit 4 hours. A survey course in the cultural and applied
aspects of chemistry designed primarily for students majoring in the Colleges of Business,
Education, and the humanities portion of the College of Arts and

Sciences. This course may not
be used to satisfy the General Education sequence requirement in the Natural Sciences. Course
consists of four hours of lecture and demonstrations a week.

121. Inorganic Chemistry. Credit 3 hours. Prerequisites: Registration for or prior credit for
Chemistry 123 and satisfy the prerequisites in the Chemistry Placement section in this Catalogue.
A course in general chemistry required of all chemistry and physics majors and other technical
students whose curricula require chemistry above the introductory level.

122. Inorganic Chemistry. Credit 3 hours. Prerequisites: Chemistry 121-123 and registration for
or prior credit for Chemistry 124. A continuation of Chemistry 121 required of all chemistry and
physics majors and other technical students whose curricula require chemistry above the
introductory level.

123. Inorganic Chemistry Laboratory. Credit 1 hour. Prerequisite: Registration for or prior
credit for Chemistry 121. A series of laboratory experiments designed to illustrate the material
studied in Chemistry 121 and to introduce the student to the experimental techniques of chemistry.
Three hours of laboratory a week. Laboratory fee: $15.00.

124. Inorganic Chemistry Laboratory. Credit 1 hour. Prerequisite: Registration for or prior credit
for Chemistry 122. A continuation of Chemistry 123. Three hours of laboratory a week.
Laboratory fee: $15.00.

251. Analytical Chemistry. Credit 3 hours. Prerequisites: Chemistry 122-124. The study of
chemical equilibria and stoichiometry as applied to qualitative and quantitative analysis.

253. Inorganic Solution Chemistry. Credit 2 hours. Prerequisite: Chemistry 122-124. A

laboratory course emphasizing the solution chemistry of inorganic cations and anions. Studies of
buffers and Beer's law are done as well as standard analysis of solution and solid unknowns.
Separations based on precipitation, oxidation, reduction and complexation are emphasized using
the chemistry of inorganic compounds. Six hours of laboratory per week. Laboratory fee: $15.00.

254. Quantitative Analysis Laboratory. Credit 2 hours. Prerequisites: Chemistry 122-124 and
registration for prior credit for Chemistry 251. A laboratory course emphasizing the quantitative
analysis of common minerals and ores using volumetric, gravimetric, and elementary
instrumental procedures. Six hours of laboratory a week. Laboratory fee: $15.00.

261. Survey of Organic Chemistry. Credit 3 hours. Prerequisites: Chemistry 102-104 or 122-124 and
registration for or prior credit for Chemistry 263. An introduction to the nomenclature, preparation,
properties, and reactions of organic compounds, with attention to biological significance. This
course is designed for students in Biological and Applied Sciences who are required to take only
one semester of organic chemistry.

263. Survey of Organic Chemistry Laboratory. Credit 1 hour. Prerequisite: Registration for or
prior credit for Chemistry 261. Designed to acquaint the student with some of the important
laboratory operations and techniques in organic chemistry. Two hours of laboratory a week.
Laboratory fee: $15.00.

265[361]. General Organic Chemistry. Credit 3 hours. Prerequisites: Chemistry 122 and
registration for or prior credit for Chemistry 267. A study of the compounds of carbon, including
representative groups and topics in stereochemistry. A course designed for students in biological
sciences, chemistry, and pre-professional curricula.

266[362]. General Organic Chemistry. Credit 3 hours. Prerequisites: Chemistry 265 and registration for or prior credit for Chemistry 268. A continuation of Chemistry 265 including the study of carbon compounds containing carbonyl, carboxylic acid, amine, and pheno functional groups. A course designed for students in biological sciences, chemistry and pre-professional curricula.

267[363 and 367]. General Organic Chemistry Laboratory. Credit 1 hour. Prerequisites: Chemistry 124 and registration for or prior credit for Chemistry 265. A course designed to acquaint the student with some of the more important laboratory operations and techniques in organic chemistry including an introduction to spectroscopy. A course designed for students in biological sciences, chemistry, and pre-professional curricula. Three hours of laboratory a week.
Laboratory fee: $15.00.

268[364 and 368]. General Organic Chemistry Laboratory. Credit 1 hour. Prerequisites: Chemistry 267 and registration for or prior credit for Chemistry 266. A continuation of Chemistry 267. Designed to acquaint the student with important laboratory operations in organic chemistry with special emphasis on reactions and synthesis. A course for students in biological sciences, chemistry, and pre-professional curricula. Three hours of laboratory a week.
Laboratory fee: $15.00.

281. Survey of Biochemistry. Credit 3 hours. Prerequisites: Chemistry 261-263, or 266-268 and registration for or prior credit for Chemistry 283. A general study of the intermediary metabolism of carbohydrates, fats, and proteins with emphasis on foods. A course designed for students in Applied Sciences and Science Education. This course may not be used for a major

or minor in chemistry.

283. Survey of Biochemistry Laboratory. Credit 1 hour. Prerequisite: Prior credit for CHEM 263 and registration for or prior credit for CHEM 281. A laboratory to accompany Chemistry 281. Two hours of laboratory a week. Laboratory fee: $15.00.

290. Survey of Physical Chemistry. Credit 3 hours. Prerequisites: Chemistry 122-124, Physics 192-194, and Mathematics 163 or 200. An introduction to the structure and physical states (gaseous, liquid, and solid) of matter, properties of solutions, electrochemistry, kinetics, and chemical thermodynamics.

306/506. Special Topics in Science Education. Credit 1-3 hours per semester. A reading course with topics and credit to be decided by agreement between the department and student. This course can be taken only by science education or elementary education majors and/or elementary and secondary school teachers or by consent of the Department Head of Chemistry and Physics. This course may be repeated for credit if different topics are studied.

335/535.1 Chemistry Education Laboratory. Credit 3 hours. Prerequisite: This course can only be taken by science education majors or by consent of the Department Head of Chemistry and Physics. A laboratory course designed for secondary and/or elementary school science teachers. Experiments will be presented and performed that illustrate the theories of chemistry and that can be used as demonstrations. Theory will be presented and used in conjunction with experiments. Six hours of laboratory per week. Laboratory fee: $15.00.

395/595. Physical Chemistry I. Credit 3 hours. Prerequisites: Chemistry 122-124 and Math 201. A quantitative study of physical chemistry emphasizing gas laws and kinetic theory of gases,

thermodynamics of the gaseous and liquid state, chemical and phase equilibria.

396/596. Physical Chemistry II. Credit 3 hours. Prerequisites: Chemistry 395/595. A continuation of Chemistry 395/595. A study of chemical kinetics, statistical thermodynamics, and atomic and molecular structure.

397/597. Physical Chemistry Laboratory I. Credit 2 hours. Prerequisites: Concurrent enrollment or prior credit for Chemistry 395/595. Quantitative physical chemistry measurements, design and construction of apparatus and interpretation of data. Six hours of laboratory a week. Laboratory fee: $15.00.

398/598. Physical Chemistry Laboratory II. Credit 2 hours. Prerequisites: Concurrent enrollment or prior credit for Chemistry 396/596. A continuation of Chemistry 397/597. Six hours of laboratory a week. Laboratory fee: $15.00.

401/502. Chemistry Seminar. Credit 1 hour. Prerequisite: Chemistry 201 and 301 or permission of the Department Head. Attendance at departmental seminars, panel discussions, and related professional events and individual presentation of a topic of current research interest.

404/504 [605]. Special Topics in Chemistry. Credit 1-3 hours per semester. A reading course with topics and credit to be decided by agreement between the Department and student. This course may be repeated for a maximum of 9 credit hours if different topics are studied.

410/510. Chemical Literature. Credit 1 hour. Prerequisites: Chemistry 251, 265, and 395 or consent of the Department Head. Familiarization with and review of the chemical literature. Designed to serve as preparation for Chemistry 411.

411/511. Chemical Research. Credit 1-4 hours per semester. Maximum credit four hours.
Prerequisites: Chemistry 396 and 410 and consent of the instructor and Department Head. Three
clock hours per credit hour. Laboratory fee: $15.00.

452/552. Modern Instrumental Analysis. Credit 3 hours.
Prerequisites: Chemistry 251, 254, 266,
and 396. A course designed to study instruments used in modern chemical analysis, focusing on
instrument design, origin and quality of signal, methods of detection, spectral interpretation,
and computer integration.

453/553. Instrumental Analysis Laboratory. Credit 2 hours.
Prerequisites: Chemistry Lab 254,
CHEM 266, Chemistry Lab 268 and concurrent enrollment or prior credit for CHEM 396/596
and CHEM 452/552. Experiments designed to demonstrate current analytical instrumental methods
including spectroscopy, chromatography, and electroanalytical methods. Six hours of laboratory
per week. Laboratory fee: $15.00.

462/562. Physical Organic Chemistry. Credit 3 hours. Prerequisites: Chemistry 266-268 and 396.
Quantitative mathematical approaches to organic mechanisms; structure related to reactivity.

471/571. Inorganic Chemistry. Credit 3 hours. Prerequisite: Chemistry 396. Modern
interpretation utilized to present the principles of inorganic chemistry at an advanced level.

473/573. Inorganic Chemistry Laboratory. Credit 1 hour.
Prerequisites: Chemistry 266,
Chemistry 268, and Chemistry 395 and registration for or prior credit for Chemistry 471. A
course designed to acquaint the student with important laboratory operations and techniques in
inorganic and organometallic chemistry. Three hours of laboratory a week. Laboratory fee:
$15.00.

481/581. Biochemistry. Credit 3 hours. Prerequisites: Chemistry 266-268 and Chemistry 395 or permission of the Department Head. A study of the chemical composition and chemical transformations of living cells. A course designed for majors in zoology or chemistry.

482/582. Biochemistry. Credit 3 hours. Prerequisite: Chemistry 481. A continuation of Chemistry 481.

483/583. Biochemistry Laboratory. Credit 2 hours. Prerequisite: Registration for or prior credit for Chemistry 481. A laboratory to accompany Chemistry 481. Six hours of laboratory a week. Laboratory fee: $15.00.

484/584. Biochemistry Laboratory. Credit 2 hours. Prerequisites: Registration for or prior credit for Chemistry 482 and prior credit for Chemistry 483. A laboratory to accompany Chemistry 482. Six hours of laboratory a week. Laboratory fee: $15.00.

491/591. Theoretical Chemistry. Credit 3 hours. Prerequisites: Chemistry 396 and Physics 222-224. Advanced treatment of fundamental principles of physical chemistry. Selected topics chosen from electro-chemistry, photochemistry, surfaces and colloids, solid state chemistry, crystallography, solutions (ideal and real), and statistical thermodynamics.

492/592. Quantum Chemistry. Credit 3 hours. Prerequisite: Chemistry 491. Fundamental concepts of quantum mechanics with application to atomic and molecular structure, the chemical bond, symmetry, and spectroscopy.

554. Chemical Analysis for Teachers. Credit 3 hours. Prerequisites: Chemistry 122-124 and permission of the Department Head of Chemistry. A laboratory course

to help science teachers
understand the concepts of quantitative chemical analysis as used in the laboratory. The course is
open only to secondary school teachers. Credit will not be given for both this course and
Chemistry 254. Six hours of laboratory per week. Laboratory fee: $15.00.

555. Qualitative Analysis for Teachers. Credit 3 hours. Prerequisites: Chemistry 122-124 and
permission of the Department Head of Chemistry. A laboratory course designed to help science
teachers understand the concepts of inorganic solution chemistry. This course is open only to
secondary school teachers. Credit will not be given for both this course and Chemistry 253. Six
hours of laboratory per week. Laboratory fee: $15.00.

Earth Science (EASC)

101. Earth Science I. Credit 3 hours. Prerequisite: Registration for or prior credit for Earth
Science 103. An elementary treatment of Earth/space relationships and the solar and stellar
system.

102. Earth Science II. Credit 3 hours. Prerequisite: Prior credit for Earth Science 101 and
registration for or prior credit for Earth Science 104 or permission of the Department Head. An
elementary study of geology and oceanography.

103. Earth Science Laboratory I. Credit 1 hour. Prerequisites: Registration for or prior credit
for Earth Science 101. A series of selected experiments to aid students in their understanding of
celestial mechanics. Two hours of laboratory a week.

104. Earth Science Laboratory II. Credit 1 hour. Prerequisites: Prior credit for Earth Science
103 and registration for or prior credit for Earth Science 102 or permission of the Department Head.

A series of activities to aid students in their understanding of geological formations and processes. Two hours of laboratory a week.

201. Earth Science III. Credit 3 hours. Prerequisite: Earth Science 101 and 103. A continuation of Earth Science 101. Emphasis will be on stars and stellar systems, stellar evolution, galactic structure and basic cosmology.

205. Special Topics in Earth Science. Credit 4 hours. Prerequisites: A 100 level Earth Science lecture and lab and permission of the Department Head. Selected topics in Earth Science that are new or unique and are not covered in existing courses. This course is designed primarily for education majors. This course is a guided inquiry approach to learning and also integrates a service-learning component. It is comparable to a three hour lecture/two hour laboratory per week course. This course may not be used to satisfy the General Education sequence requirement in the Natural Sciences. This course may be repeated, as topics vary, for a maximum of 12 credit hours.

Physics (PHYS)

100. Acoustics for Musicians. Credit 4 hours. The fundamentals of sound, waves and related phenomena for music majors. Four hours of lecture per week.

121. Elementary Modern Electronics. Credit 3 hours. Prerequisite: Registration for or prior credit for Physic 123. A course emphasizing circuit design with modern integrated circuit chips.

123. Elementary Modern Electronics Laboratory. Credit 1 hour. Prerequisite: Registration

for or prior credit for Physics 121. A laboratory course involving the construction of radios, digital counters, clocks, frequency meters and other devices for electronic measurement and control.

130. Contemporary Physics Seminar. Credit 1 hour. This course is designed to convey an understanding of and appreciation for physics and science by finding their applications to specific objects of everyday experience, and their role in current events. Instead of starting with physics principles and working outward to the real world, students start by looking at familiar real-world objects. Seminars, reviews, and discussions by guest speakers, faculty, and students will be presented.

142. Elementary Physics. Credit 4 hours. Prerequisites: Education majors, inservice teachers, or permission of Instructor or Department Head. This course is designed to prepare preservice and inservice K-12 teachers to teach physical science as a process of inquiry. The curriculum will focus on small number of topics in elementary physics, and students will actively engage in a process of hands-on investigation and discovery in a laboratory setting. The central objective is to provide an active learning environment that promotes critical thinking skills, collaborative learning, and an understanding and appreciation of the process of scientific investigation. Three hours of lecture and two hours of laboratory per week.

191. General Physics. Credit 3 hours. Prerequisites: Mathematics 162, or permission of Department Head, and registration for or prior credit for Physics 193. A study of the fundamentals of mechanics, heat and sound for

students in the biological sciences, industrial technology, and other areas where a knowledge of calculus is not required.

192. General Physics. Credit 3 hours. Prerequisites: Physics 191-193 and registration for or prior credit for Physics 194. A study of the fundamentals of electricity, magnetism, light, and modern physics for students in the biological sciences, industrial technology, and other areas where a knowledge of calculus is not required.

193. General Physics Laboratory. Credit 1 hour. Prerequisite: Registration for or prior credit for Physics 191. Selected laboratory experiments designed to supplement the lecture in Physics 191. Two hours of laboratory a week.

194. General Physics Laboratory. Credit 1 hour. Prerequisite: Registration for or prior credit for Physics 192. Selected laboratory experiments designed to supplement the lecture in Physics 192. Two hours of laboratory a week.

221. General Physics. Credit 3 hours. Prerequisites: Registration for or prior credit for Physics 223 and Mathematics 201. Basic principles of mechanics, heat and sound for technical students only.

222. General Physics. Credit 3 hours. Prerequisites: Physics 221-223 and registration for or prior credit for Physics 224. Basic principles of electricity, magnetism, and light for technical students only.

223. General Physics Laboratory. Credit 1 hour. Prerequisite: Registration for or prior credit for Physics 221. A corresponding laboratory course for Physics 221. Three hours of laboratory a week.

224. General Physics Laboratory. Credit 1 hour. Prerequisite: Registration for or prior credit for Physics 222. A corresponding laboratory

course for
Physics 222. Three hours of laboratory a week.

241. Engineering Statics. Credit 3 hours. Prerequisites: PHYS 221 and PHYS
222 and MATH 201. Vectors; two-dimensional and three-dimensional force
system; equilibrium; friction; centriods; mass moments of interia; second
moments of areas.

242. Engineering Circuits. Credit 3 hours. Prerequisites: PHYS 221 and
PHYS 222 and MATH 201. Introduction to linear, time-invariant and jumped
circuits. Kirchoff's laws, analysis of resistive circuits and steady-state
and analysis of R,L.C and transformer circuits.

301. Electricity and Magnetism. Credit 3 hours. Prerequisites: Physics
222-224. Advanced study of the fundamentals of electricity and magnetism.

303. Electricity and Magnetism Laboratory. Credit 1 hour. Prerequisite:
Registration for or prior credit for Physics 301. Selected experiments in
advanced electricity and magnetism. Three hours of laboratory a week.

312. Optics. Credit 3 hours. Prerequisites: Physics 222-224 and registration
for or prior credit for Physics 314. Advanced study of the fundamentals of
geometric and physical optics.

314. Optics Laboratory. Credit 1 hour. Prerequisite: Registration for or
prior credit for Physics 312. A laboratory course designed to introduce
the student to the operational techniques of advanced optical instruments.
Two hours of laboratory a week.

321. Thermodynamics. Credit 3 hours. Prerequisites: Physics 222-224 and Mathematics 201. An introduction to the principles of thermodynamics, kinetic theory, and statistical mechanics.

331. Mathematical Physics. Credit 3 hours. Prerequisites: Physics 222-224 and Mathematics 201. A study of vectors, complex variables, and other selected topics that have application in mechanics, electromagnetic wave theory, and vibratory motion.

332. Intermediate Mechanics. Credit 3 hours. Prerequisite: Physics 331. A study of the fundamentals of mechanics.

335/535. Physics Education Laboratory. Credit 3 hours. Prerequisite: This course can only be taken by science education majors or by consent of the Department Head of Chemistry and Physics. A laboratory course designed for secondary and/or elementary school science teachers. Experiments will be presented and performed that illustrate the theories of physics and that can be used as demonstrations. Theory will be presented and used in conjunction with experiments. Six hours of laboratory per week.

336/536. Physical Science Laboratory. Credit 4 hours. This course may be taken only by elementary education majors and elementary school teachers or by consent of the DepartmentHead of Chemistry and Physics. A laboratory course designed for elementary education majors or elementary school teachers. Experiments will be presented and performed that illustrate physical theories and that can be used as demonstrations. Theory and concepts will be presented and used in conjunction with experiments. Six hours of laboratory per week.

351. Atomic and Nuclear Physics. Credit 3 hours. Prerequisites: Physics 222-224. A study of atomic and nuclear structure, nuclear radiation, and applications.

401/501. Vibratory Motion. Credit 3 hours. Prerequisites: Physics 331 and Mathematics 401. An advanced analytical study of vibrating systems and the transmission of sound waves.

402/502. Electromagnetic Wave Theory. Credit 3 hours. Prerequisites: Physics 301-303 and Mathematics 402. A theoretical treatment of electromagnetic waves.

411/511. Physics Seminar. Credit 1 hour. Prerequisite: Permission of the Department Head. Reviews and discussion of current research topics by students, faculty, and industrial personnel.

412/512. Physics Seminar. Credit 1 hour. A continuation of Physics 411/511.

421/521. Modern Physics. Credit 3 hours. Prerequisites: Physics 301-303 and Mathematics 401. A survey of the modern physical theories of relativity, quantum mechanics, the solid state, molecular structure, astrophysics, and elementary particles.

422/522. Modern Physics. Credit 3 hours. Prerequisite: Physics 421/521 and Mathematics 402. A continuation of Physics 421/521.

425. Advanced Undergraduate Laboratory. Credit 2 hours. Prerequisites: Physics 301, 303, and Physics 351. An advanced laboratory for all majors in physics. Selected experiments in modern physics will be performed with

an emphasis on data acquisition and error analysis. Six hours of laboratory per week.

430/530. Special Topics in Physics. Credit 1-3 hours per semester. Prerequisite: Senior standing in physics or permission of the Department Head. A reading course with topics and credit to be decided by agreement between the Department Head and the student. This course may be repeated for a total of six credit hours if different topics are studied.

Physical Science (PHSC)

101. Physical Science. Credit 4 hours. Prerequisites: Prior credit for Mathematics 160 or 161 eligibility to take Mathematics 161. A survey course in selected topics of physical science designed for non-science majors. This course may not be used to satisfy the General Education sequence requirement in the Natural Sciences. Course consists of four hours of lecture and demonstrations a week.

Updated 4 Mar 97.