

## CHEM 102

**What's in Our Food**

3 Credit Hours

This course surveys food science from a consumer perspective using lecture and hands on activities. It provides students with a foundational understanding of how science plays an integral role in the food industry from ingredient selection to final product quality. Topics include food sensory, food chemistry, health claims & nutrition, ingredient & process technology, food regulation, safety, and preservation, as well as consumer trends.

## CHEM 103

**Environmental Science**

3 Credit Hours

This course surveys scientific laws, principles, models and concepts to help the students understand both environmental and resource problems and their possible solutions and how these concepts, problems and solutions are connected. Topics may include applied aspects of environmental chemistry, global warming, biomass energy, green chemistry and the effects on non-industrialized agricultural societies and industrialized societies on the environment.

## CHEM 106

**Chemistry Essentials**

3 Credit Hours

This course introduces basic concepts in chemistry and teaches problem-solving skills used in chemical calculations. Emphasis is on the use of dimensional analysis techniques. Offered fall. NOTE: Credit does not apply toward a minor in science.

## CHEM 109

**Survey of General, Organic and Bio-Chemistry**

4 Credit Hours

*Pre/Corequisite:* E (RQ) College Level Math and C (RQ) CHEML-109

This course provides a survey of basic concepts in general chemistry, organic chemistry and biochemistry. Lecture and laboratory topics include atomic structure and chemical bonding, dimensional analysis, composition and reactions of some inorganic compounds, a survey of functional group structure and reactivity of organic compounds in general and in biochemical systems. Structure and function of biomolecules like carbohydrates, lipids, proteins, enzymes, vitamins and nucleic acids will also be discussed. Lecture 3, Laboratory 3

## CHEM 111

**General Chemistry I**

4 Credit Hours

*Pre/Corequisite:* P (RM) Completion of HS Chemistry within the last 3 years or CHEM 106 with a grade of "C" or better and placement into a college level math course and C (RQ) CHEML-111 and E (RQ) MATH-112

This course focuses on the study of atomic structure, periodicity, basic quantum theory, bonding, stoichiometry, thermochemistry, the gaseous state, physical changes and states of matter, properties of solutions, and acids and bases. Lecture 3, Laboratory 4.

## CHEM 112

**General Chemistry II**

4 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-111 with a C or better MATH-112 and E (RQ) MATH-113 and C (RQ) CHEML-112

This course focuses on the study of acid-base and solubility equilibria, kinetics, thermodynamics, electro-chemistry, coordination compounds, nuclear chemistry and descriptive topics in inorganic chemistry. Lecture 3, Laboratory 4.

## CHEM 150

**Special Topics in Chemical Science**

1 to 3 Credit Hours

This course focuses on the study of topics not regularly scheduled and not covered in other courses. Suggested topics concern nuclear science, forensic science and environmental science. Prerequisite: A high school or college chemistry course or consent of instructor.

## CHEM 209

**Survey of Organic Chemistry with Biological Applications**

4 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 and C (RQ) CHEML-209

This is a one-semester survey course in organic chemistry with biological applications designed for students in General Biology, Natural Science, Secondary Education, etc. This course explores the structure, bonding, physical properties and nomenclature of organic materials and biological systems along with stereochemistry and reaction mechanisms of organic compounds exemplified by biological reactions. Analysis of organic molecules using various spectroscopy: IR, NMR, UV, an MS, will be taught. Application of the organic reactions in biological systems will be covered through introduction to the following topics: Amino Acids, Lipids, Carbohydrates, Metabolism, Peptides, and Proteins. This course is not intended for Biology Pre-Health majors, as they need to take the CHEM 251/252 series. This course does not provide adequate preparation for Organic Chemistry II, CHEM 252. This course does not provide adequate preparation for Biochemistry I, CHEM 301. Lecture 3, Laboratory 3.

## CHEM 211

**Analytical Chemistry**

5 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 and C (RQ) CHEML-211

This course involves theories and applications of analytical methods. Environmental, household and industrial samples are quantitatively assayed using gravimetric, volumetric, electroanalytical and spectrometric methods. Lecture 3, Laboratory 4. Offered fall.

## CHEM 213

**Environmental Chemistry**

4 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112, MATH-113 and C (RQ) CHEML-213

This course will introduce the processes that regulate the composition of air, water, and soil on planet Earth. Emphasis will be on understanding chemical equilibrium and kinetics of natural systems and examining the sources, reactions, effects, and fates of chemicals in air, water, and soil. The laboratory

will incorporate current practices and instruments to analyze such environmental samples.

CHEM 250

**Special Topics in Chemistry**

0 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 and consent of instructor

This course includes formal courses covering individual topics or groups of topics not regularly scheduled and not covered in other courses. Suggested topics include clinical, environmental, food, forensic, geochemistry, industrial and nuclear chemistry.

CHEM 251

**Organic Chemistry I**

3 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 with a C or better and E (RQ) CHEML-251

This course discusses bonding, structure, reactivity, isomerism, nomenclature and stereochemistry of aliphatic and aromatic hydrocarbons (saturated and unsaturated). Particular emphasis is placed on the mechanism of organic reactions (physical-organic chemistry) and spectroscopy. Lecture 4. Offered fall.

CHEML 251

**Organic Chemistry I Lab**

1 Credit Hour

*Pre/Corequisite:* P (RQ) CHEM-112 with a C or better and E (RQ) CHEM-251

This course explores methods of purification and separation of organic compounds: distillation, extraction, crystallization, thin layer, column and gas-liquid chromatography and resolution. The preparation of several simple organic compounds is included. Laboratory 4. Offered fall.

CHEM 252

**Organic Chemistry II**

3 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-251 and E (RQ) CHEML-252

This course discusses the structure and reactivity of a variety of functional groups (halides, alcohols, ethers, carboxylic acids and derivatives, aldehydes, ketones, and amines). Emphasis is placed on the mechanisms of reactions and the spectral properties of the various functional groups. The knowledge of functional group chemistry is extended to compounds of biological importance: fats, amino acids, proteins, carbohydrates, alkaloids and organic pesticides. Lecture 4. Offered spring.

CHEML 252

**Organic Chemistry II Lab**

1 Credit Hour

*Pre/Corequisite:* P (RQ) CHEML-251 and E (RQ) CHEM-252

This course explores reactions and properties of typical organic functional groups. Preparation of typical classes of organic compounds is also included. Laboratory 4. Offered spring.

CHEM 301

**Biochemistry I**

3 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-252

This course discusses structures and properties of amino acids, proteins, carbohydrates, enzymes, coenzymes and nucleic acids. Introductions to bioenergetics and metabolism are included. Offered fall.

CHEML 301

**Biochemistry Laboratory I**

1 Credit Hour

*Pre/Corequisite:* E (RQ) CHEM-301

This course is an introduction to biochemical laboratory techniques. Experiments include purification and characterization of various biomolecules and enzyme kinetics. Laboratory 3. Offered fall.

CHEM 302

**Biochemistry II**

3 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-301 CHEML-301

This course discusses metabolism of carbohydrates, lipids, amino acids, proteins and nucleic acids. Biosynthesis of macromolecules and regulatory processes are included. Offered spring even years.

CHEML 304

**Synthesis and Characterization Lab**

2 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-209 or CHEML-251

This course includes syntheses of a variety of organic and inorganic compounds. Products are characterized using both chemical and spectral techniques. Laboratory 4. Offered spring even years.

CHEM 305

**Advanced Inorganic Chemistry**

3 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112

Topics explored in this course include atomic structure, periodicity, bonding theory, acid-base concepts, coordination and organometallic and bioinorganic chemistry. Offered fall odd years.

CHEM 311

**Instrumental Methods of Analysis**

4 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 MATH-201 and C (RQ) CHEML-311

Theory and applications of instrumental methods for chemical analysis with emphasis on sample handling, instrument parameters and statistical evaluation of data. Includes measurement basics, atomic and molecular spectroscopy, electroanalytical chemistry, separation methods and troubleshooting. Lecture 2, Laboratory 4. Offered spring odd years.

CHEM 331

**Physical Chemistry I**

4 Credit Hours

*Pre/Corequisite:* P (RQ) PHYS-202 or PHYS-212 and C (RQ) CHEML-331 and P (RQ) CHEM-112 MATH-202

This course discusses the laws and applications of thermodynamics; reaction and phase equilibria; reaction kinetics. The laboratory component explores: thermochemical and cryoscopic studies phase diagrams, measurement of thermodynamics quantities and studies of surface phenomena. Lecture 3, Laboratory 4. Offered spring.

CHEM 332

**Physical Chemistry II**

4 Credit Hours

*Pre/Corequisite:* P (RQ) CHEM-112 MATH-202 and C (RQ) CHEML-332

This course discusses electrochemical systems; transport phenomena; atomic and molecular quantum mechanics; spectroscopy, statistical mechanics. The laboratory component explores: electrochemical measurements, macromolecular characterization, spectroscopic determination of physical properties of molecules, quantum mechanical computations with application of group theory to chemical symmetry. Lecture 3, Laboratory 3. Offered fall even years.

CHEM 340

**Scanning Electron Microscopy**

2 Credit Hours

During the scanning electron microscopy course, students learn through lecture, demonstration, and hands-on participation how to set up and operate SEM and EDS instruments, including low-vacuum and field-emission models. Students have the opportunity to study their own samples, or test samples provided by our experienced instructors. Course offered at Hooke College of Microscopy in Westmont, IL.

CHEM 341

**Atomic Force Microscopy and Scanning**

1 Credit Hour

This AFM/SPM course provides a foundation for students in the principles of operation of atomic force microscopes, basic and advanced imaging modes, overall capabilities of atomic force microscopy/scanning probe microscopy and how best to operate the microscope depending on the sample. In this practical hands-on course, students will be trained on Bruker and Asylum Research AFMs. Lectures are interwoven with labs on a variety of samples so that students learn, understand, and operate state-of-the-art microscopes. This course is intended for students new to AFM/SPM. Course offered at Hooke College of Microscopy in Westmont, IL.

CHEM 342

**Pharmaceutical Materials and Contaminant**

2 Credit Hours

Utilizing microscopical examination coupled with sample isolation, preparation, and analytical method optimized for small particles, this pharmaceutical analysis course teaches an analytical approach to successfully identifying particulate contamination for regulatory compliance. The overall analytical approach for the identification of contaminant particles in

pharmaceuticals is outlined at the beginning of the course. The analysis plan includes sample examination, gathering of background information concerning the sample, and particle isolation. Course offered at Hooke College of Microscopy in Westmont, IL.

CHEM 350

**Special Topics: Chemistry**

1 to 2 Credit Hours

This course includes formal courses covering individual topics or groups of topics not regularly scheduled and not covered in other courses. Suggested topics include advanced quantum, environmental, industrial, materials, medicinal, organometallic, physical-organic and polymer chemistry. NOTE: Consent of instructor required.

CHEM 351

**Introduction to Research I**

1 to 3 Credit Hours

This is the first part of a research course in the use of the chemical library and individual laboratory study of some problem in chemistry. Offered at the request of students. Note: Science majors with junior or senior status and/or consent of the faculty mentor.

CHEM 352

**Introduction to Research II**

1 to 3 Credit Hours

This is the second part of a research course in the use of the chemical library and individual laboratory study of some problem in chemistry. Offered at the request of students. NOTE: Science majors with junior or senior status and/or consent of the faculty mentor.

CHEM 353

**Independent Study**

1 to 3 Credit Hours

This course is an informal study of advanced topics in chemistry on a tutorial basis. Offered at the request of students. NOTE: Science majors with junior or senior status and/or consent of the program faculty supervisor.

CHEM 356

**Introduction to Senior Seminar**

1 Credit Hour

In this course students identify a mentor and research topic and begin assembling materials for Senior Seminar. Senior status required.

CHEM 357

**Senior Seminar**

1 Credit Hour

*Pre/Corequisite:* P (RQ) CHEM-356 and senior status  
In this course students conduct library or laboratory research. A paper is written and a presentation is given to faculty and students.

CHEM 360

**Internship**

0 to 3 Credit Hours

The student will spend a specified number of hours in a chemical work setting, report regularly to an academic supervisor and receive assignments appropriate to his/her type of work. Offered by special arrangement.