

## [ A ]

**AIRS**

## College of Education and Psychology

**AIRS 001. Leadership Laboratory.** 0 credits. *Offered fall and spring.*

This course is a mandatory laboratory in leadership and followership development for AFROTC cadets. As a complement to the air science classes, this laboratory focuses on applying leadership principles and understanding leaders' responsibilities while emphasizing the benefits of practical experience. JMU students will take AFROTC classes at the University of Virginia for JMU credit. *Prerequisite: Permission of the instructor. Corequisite: Any Air Force ROTC class.*

**AIRS 110. The Foundations of the United States Air Force.** 1 credit.

This course introduces the United States Air Force and Air Force Reserve Officers Training Corps. Topics include mission and organization of the Air Force, Officership and professionalism, military customs and courtesies, Air Force officer opportunities and communication skills. JMU students will take AFROTC classes at the University of Virginia for JMU credit. Students interested in joining Air Force ROTC should also register for AIRS 001- Leadership Laboratory. *Prerequisite: Permission of the instructor.*

**AIRS 120. The Foundations of the United States Air Force.** 1 credit.

This course introduces the United States Air Force and Air Force Reserve Officers Training Corps. Topics include mission and organization of the Air Force, Officership and professionalism, military customs and courtesies, Air Force officer opportunities and communication skills. JMU students will take AFROTC classes at the University of Virginia for JMU credit. Students interested in joining Air Force ROTC should also register for AIRS 001- Leadership Laboratory. *Prerequisite: Permission of the instructor.*

**AIRS 210. The Evolution of Air and Space Power.** 1 credit.

This course examines general aspects of air and space power through a historical perspective, from the first balloons and dirigibles to the space age global positioning systems of the Persian Gulf War. Topics include Principles of War, Tenets of Air and Space Power, historical Air Force leaders, and employment of air and space power. JMU students will take AFROTC classes at the University of Virginia for JMU credit. Students interested in joining Air Force ROTC should also register for AIRS 001- Leadership Laboratory. *Prerequisite: Permission of the instructor.*

**AIRS 220. The Evolution of Air and Space Power.** 1 credit.

This course examines general aspects of air and space power through a historical perspective, from the first balloons and dirigibles to the space age global positioning systems of the Persian Gulf War. Topics include Principles of War, Tenets of Air and Space Power, historical Air Force leaders, and employment of air and space power. JMU students will take AFROTC classes at the University of Virginia for JMU credit. Students interested in joining Air Force ROTC should also register for AIRS 001- Leadership Laboratory. *Prerequisite: Permission of the instructor.*

**AIRS 310. Concepts of Air Force Leadership and Management.**

3 credits.

This course studies leadership, management fundamentals, and professional knowledge, Air Force personnel and evaluation systems, leadership ethics, and communication skills required of Air Force junior officers. The class examines Air Force leadership and management situations, using case studies as a means of demonstrating and applying the concepts under consideration. JMU students will take AFROTC classes at the University of Virginia for JMU credit. *Prerequisite: Permission of the instructor.*

**AIRS 320. Concepts of Air Force Leadership and Management.**

3 credits.

This course studies leadership, management fundamentals, and professional knowledge, Air Force personnel and evaluation systems, leadership ethics, and communication skills required of Air Force junior officers. The class examines Air Force leadership and management situations, using case studies as a means of demonstrating and applying the concepts under consideration. JMU students will take AFROTC classes at the University of Virginia for JMU credit. *Prerequisite: Permission of the instructor.*

**AIRS 410. National Security Affairs/Preparation for Active Duty.**

3 credits.

This course examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine. Topics include the military as a profession, officership, military justice, civilian control of the military, preparation for active duty, and current issues affecting the military profession. JMU students will take AFROTC classes at the University of Virginia for JMU credit. *Prerequisite: Permission of the instructor.*

**AIRS 420. National Security Affairs/Preparation for Active Duty.**

3 credits.

This course examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine. Topics include the military as a profession, officership, military justice, civilian control of the military, preparation for active duty, and current issues affecting the military profession. JMU students will take AFROTC classes at the University of Virginia for JMU credit. *Prerequisite: Permission of the instructor.*

## [ B ]

## Business and Marketing Education

## School of Education

**BMED 200. Introduction to Business and Marketing Education.** 3 credits. *Offered fall and spring.*

A general survey of business and marketing principles as they relate to preparation for teaching, with emphasis on the history of business and marketing in America, the basic forms of business organizations, ownership, finance, management, taxes and wages, and labor relations.

**BMED 230. Document Design and Production.** 3 credits. *Offered fall and spring.*

Experience in planning, designing and producing documents for the business office with focus on transferability of productivity among the genre of word processing software. *Prerequisite: Keyboard in excess of 40 words per minute with at least 95 percent word accuracy without visual reference to the keyboard.*

**BMED 300. Data and Records Management.** 3 credits. *Offered fall and spring.*

Develops skills in managing the information of business by organizing data through the creation and use of computer spreadsheets and databases. Includes the management and organization of hard records.

**BMED 376. Occupational Experience in Business.** 3 credits. *Offered fall and spring.*

Supervised internship providing business office experience for students seeking licensure as business education teachers in middle and secondary schools. A credit/no credit grade will be assigned. *Prerequisite: Permission of the instructor.*

**BMED 377. Occupational Experience in Marketing.** 3 credits. *Offered fall and spring.*

Supervised internship providing marketing (retail, promotion, entertainment, merchandising, etc.) experience for students seeking licensure as marketing education teachers in middle and secondary schools. A credit/no credit grade will be assigned. *Prerequisite: Permission of the instructor.*

**BMED 380. Demonstration Methods for Business and Marketing.** 3 credits. *Offered fall and spring.*

Development of an instructional model incorporating demonstrations and supervised walk-throughs in planning and directing the learning of computer-related and other complex business and marketing procedures and processes.

**BMED 400. Business and Marketing Communications.** 3 credits. *Offered fall and spring.*

Develops skills in communicating effectively through formal and informal business reports, letters and memorandums. Emphasis on realistic problem solving involving collecting, organizing, analyzing, interpreting and presenting data. *Prerequisites: GWRIT 101 and GWRIT 102 and BMED 230 or equivalent.*

**BMED 430. Desktop Publishing Design and Production.** 3 credits. *Offered fall and spring.*

Experience in planning, designing and producing the publications of business and education with focus on transferability of functions among the genre of desktop publishing software.

**BMED 490. Independent Study in Business and Marketing Education.** 1-3 credits. *Offered fall and spring.*

Provides opportunity to complete independent study or research on problems in business and marketing education. *Prerequisite: Permission of the program coordinator.*

## [ C ]

## Chemistry

## Department of Chemistry

**CHEM 100. Chemistry Today.** 3 credits. *Offered fall and spring.*

Provides the background necessary to understand how chemistry affects our daily lives. An enriched overview of the fundamental principles of chemistry is followed by applications to topics of current interest. A high school science background is assumed. Not available for major or minor credit in chemistry.

**\*CHEM 120. Concepts of Chemistry.** 3 credits. *Offered fall and spring.*

A one-semester introduction to the fundamental principles, laws and applications of chemistry. Examples relating to the health sciences are emphasized. Not available for major or minor credit in chemistry.

**CHEM 120L. Concepts of Chemistry Laboratory.** 1 credit.

A one-semester introduction to laboratory work which illustrates the fundamental principles, laws and applications of chemistry discussed in CHEM 120. Experiments relating to the health sciences are emphasized. *Prerequisite or corequisite: CHEM 120.*

**\*CHEM 131. General Chemistry I.** 3 credits. *Offered fall and spring.*

The first of a two-course general chemistry sequence for science majors. It is designed to introduce students to basic chemical concepts including atomic structure, periodic properties of the elements, nomenclature, basic stoichiometry, theories related to reactivity and bonding and the behavior of materials. The laboratory and lecture portions of CHEM 131 must be taken concurrently. Chemistry majors take 135L rather than 131L.

**CHEM 132. General Chemistry II.** 3 credits. *Offered fall and spring.*

A course designed to examine the mechanisms by which chemists obtain information about reacting systems. Major concepts covered include: chemical reactivity, chemical equilibrium, electrochemistry, thermodynamics and kinetics. *Prerequisite: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or CHEM 135L; corequisite: CHEM 132L or 136L; chemistry majors take 136L.*

**CHEM 131L\*-132L. General Chemistry Laboratories.** 1 credit each semester.

These laboratory courses are designed to complement and supplement the CHEM 131-132 lecture courses. The laboratory and lecture portions must be taken concurrently. Chemistry majors are to take CHEM 135L and 136L, listed below. *Prerequisite for CHEM 132L: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or CHEM 135L.*

**CHEM 135L. Special General Chemistry Laboratory.** 1 credit.

An enriched laboratory course designed primarily for chemistry majors. *Corequisite: CHEM 131.*

**CHEM 136L. Special General Chemistry Laboratory.** 1 credits.

An enriched laboratory course which includes special topics and experiments not presented in the regular CHEM 132 laboratory. *Prerequisite: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or 135L; Corequisite or prerequisite: CHEM 132.*

**CHEM 200. Computer Applications in Chemistry.** 1 credit.

Students are given chemically relevant problems that require that they learn to use the software all literate chemists should be familiar with. In addition, students are introduced to a programming language, first by writing macros for spreadsheet, presentation or word processing programs and finally, by using a high level programming language. *Corequisite or prerequisite: CHEM 341.*

**CHEM 221. Concepts of Organic Chemistry.** 3 credits.

An introduction to the study of organic compounds with emphasis on the chemistry of functional groups, including methods of preparation and interconversions. The laboratory and lecture portions must be taken concurrently. *Prerequisites: CHEM 132 and 132L or CHEM 120 and 120L.*

**CHEM 221L. Concepts of Organic Chemistry Laboratory.** 1 credit.

Laboratory work will include training in the techniques of organic chemistry, preparation of compounds and some organic qualitative analysis. *Prerequisite or corequisite: CHEM 221.*

**CHEM 222. Concepts of Biochemistry.** 3 credits.

A brief survey of the principal constituents of living cells, proteins, carbohydrates, lipids and nucleic acids, with emphasis on their synthesis and transformations in vivo. Intermediary metabolism and protein replication will be stressed. The laboratory and lecture portions must be taken concurrently; not available for major credit. Credit may not be earned in both CHEM222 and BIO 220. *Prerequisite or corequisite: CHEM 221 and CHEM 221L ( or CHEM 342 and CHEM 346L.)*

**CHEM 222L. Concepts of Biochemistry Laboratory.** 1 credit.

The laboratory work will comprise experiments demonstrating some of the pertinent reactions including those of analytical value. *Prerequisite or corequisite: CHEM 222.*

**CHEM 270. Inorganic Chemistry I.** 3 credits.

A survey of the chemistry of the elements and modern theories of bonding. *Prerequisite: CHEM 132*

**CHEM/PHYS/MATS 275. An Introduction to Materials Science.** 3 credits.

An introduction to materials science with emphasis on general properties of materials. Topics will include crystal structure, extended and point defects and mechanical, electrical, thermal and magnetic properties of metals, ceramics, electronic materials, composites and organic materials. *Prerequisite: CHEM 131, PHYS 150, PHYS 250, ISAT 212 or permission of the instructor.*

**CHEM 280. An Alternative Lower-Division Chemistry Experience.** 1-3 credits.

This course will provide a mechanism for offering nontraditional, lower-division, lecture and/or laboratory course. It will be offered only with the approval of the full-time teaching faculty. No course will be offered more than three times under the 280 designation. Student may repeat CHEM 280 for credit when course content changes.

**CHEM 300. Numerical Methods in Chemistry.** 1 credit.

Students learn to use computational software, and a high level scientific language to facilitate the solution of numerical chemical problems.

**CHEM 325. Chemical Hazards and Laboratory Safety.** 1 credit.

A brief introduction to physical and chemical hazards which may be encountered in a laboratory setting. Methods of personal protection will be emphasized.

**CHEM 331. Physical Chemistry I.** 3 credits.

A study of thermodynamics, solutions, kinetics and macromolecules with applications of chemical and biological problems. *Prerequisite: CHEM 132; MATH 206 or MATH 236.*

**CHEM 336L. Applied Physical Chemistry Laboratory.** 1 credit.

A laboratory course which emphasizes the applied experimental aspects of physical chemistry. *Prerequisite or corequisite: CHEM 331.*

**CHEM 341-342. Organic Chemistry Lecture.** 3 credits each semester.

The major objective for this course is to teach the modern method of scientific problem solving using organic compounds as models. Emphasis will be on the chemical language (nomenclature and terminology), molecular electronic concepts, theories of organic reactions, stereochemistry and structure elucidation of organic compounds. *Prerequisite for CHEM*

341: CHEM 132; prerequisite for CHEM 342: a grade of "C-" or higher in CHEM 341; corequisite for CHEM 342: CHEM 346L or CHEM 388L.

**CHEM 346L. Organic Chemistry Laboratory.** 2 credits.

This course will present laboratory techniques and experiments associated with organic chemistry, including an introduction to synthesis, spectroscopic methods, chromatographic techniques and some qualitative organic analysis. *Prerequisite:* A grade of "C-" or higher in CHEM 341; *Corequisite:* CHEM 342.

**CHEM 351. Analytical Chemistry.** 4 credits.

The total analysis concept is introduced and developed. This framework encompasses the areas of experiment design, sample collection and treatment, and statistical evaluation of results, as well as standard analysis techniques. *Prerequisite:* CHEM 132.

**CHEM 352. Instrumental Analysis.** 3 credits.

This course emphasizes the application of instrumental techniques to the quantitative determination of chemical composition. Both instrument theory and practical applications are presented. *Prerequisite:* CHEM 351 and MATH 205 or MATH 235.

**CHEM 352L. Instrumental Analysis Laboratory.** 2 credits.

This course will introduce students to the methodology and technology associated with the design and use of chemical instrumentation. Students perform experiments that illustrate the theoretical principles associated with instrument designs and the application of instruments to the solution of qualitative and quantitative analysis problems. *Corequisite:* CHEM 352.

**CHEM 354. Environmental Chemistry Field Camp.** 3 credits.

Fundamentals of environmental chemistry with laboratory and field trip components. The basic chemical principals of environmental problems are studied. Field trips and laboratory work on real samples are integrated with lecture material. *Prerequisite:* CHEM 341 or permission of instructor.

**CHEM/GEOL 355. Geochemistry of Natural Waters.** 3 credits.

Study of chemical theory and reactions important in natural water systems. The role of atmospheric, geologic and biological inputs in determining the geochemistry of streams, rivers and oceans. *Prerequisites:* CHEM 131 and CHEM 132 or equivalent.

**CHEM/BIO 361. Biochemistry I.** 3 credits.

An introduction to the molecules and chemical reactions of living systems. Structure and function of important classes of biomolecules are explored and the relationship of structure to function is stressed. Basic metabolic sequences are discussed. *Prerequisites:* CHEM 342 and permission of instructor.

**CHEM 362. Biochemistry II.** 3 credits.

A continuation of CHEM 361 including metabolic regulation, protein biosynthesis, analytical methods and isolation of biomolecules. *Prerequisite:* CHEM 361 or permission of the instructor.

**CHEM 366L. Biochemistry Laboratory.** 2 credits.

An introduction to laboratory techniques and experimental approaches associated with modern biochemistry. Isolation and characterization of enzymes and other biomolecules are emphasized. *Prerequisite:* CHEM 361.

**CHEM 387L-388L. Integrated Inorganic/Organic Laboratory.** 2 credits each semester.

An enriched, integrated introduction to the laboratory procedures associated with inorganic and organic chemistry. Topics include apparatus design and construction, synthesis, separation methods, spectroscopic analysis and application of computers in the laboratory. *Prerequisite or corequisite:* for CHEM 387L: CHEM 341; for CHEM 388L: CHEM 270 and CHEM 342 and a grade of "C-" or higher in CHEM 387L.

**CHEM 390A, B. Problems in Chemistry.** 1-3 credits, repeatable for a total of 4 credits.

A project is undertaken dealing with some aspect of chemistry under the guidance of a faculty adviser.

**CHEM 395. Perspectives in Chemistry.** 1 credit.

A description of the technical and nontechnical capabilities expected of a university graduate who enters industry, government or academia is presented. The student is introduced to the various laws governing the chemical industry as well as to the fields of toxicology and environmental health. Experts in various disciplines discuss current topics of concern to the chemistry and biology student.

**CHEM 432. Physical Chemistry II.** 3 credits.

A study of atomic and molecular energy levels and structure as interpreted by quantum theory. *Prerequisites:* CHEM 132; MATH 206 or MATH 236; and PHYS 150 or PHYS 250.

**CHEM 438L. Physical Chemistry Laboratory.** 2 credits.

A laboratory course which emphasizes the application of various physical measurement techniques as a means of obtaining data to test fundamental chemical theory. *Corequisite:* CHEM 432.

**CHEM 440. Intermediate Organic Chemistry.** 3 credits.

An advanced study of the theory of organic chemistry as applied to chemical reactions and synthetic methods. Such topics as reaction mechanisms, spectroscopy and stereochemistry will be included. *Prerequisite:* CHEM 342.

**CHEM 445. Polymer Chemistry.** 4 credits.

A study of the synthesis and characterization of macromolecules. Polymer chemistry is discussed in a manner that focuses most attention on the properties of macromolecules that can be understood at the molecular level. *Prerequisite:* CHEM 342.

**CHEM 450. Nuclear and Radiation Chemistry.** 3 credits.

A study of the fundamentals of radioactivity in chemistry. Topics include the effects of radiation on matter, measurement of radiation, activation analysis, tracer studies and the nuclear fuel cycle. Applications of radioactive materials and radiation in industry and medicine will be described. *Prerequisites: CHEM 132 and PHYS 250 or permission of the instructor.*

**CHEM 450L. Laboratory for Nuclear and Radiation Chemistry.** 1 credit.

A laboratory course designed to demonstrate the topics covered in CHEM 450. *Corequisite: CHEM 450; Prerequisites: CHEM 132 and PHYS 250 or permission of the instructor.*

**CHEM/PHYS 455. Lasers and Their Applications to Physical Sciences.** 3 credits.

An introduction to both the theoretical and practical aspects of lasers and their applications in the physical sciences. *Prerequisite: PHYS 270, CHEM 331 or permission of the instructor.*

**CHEM 470. Inorganic Chemistry II.** 3 credits.

A study of selected topics in the field of advanced inorganic chemistry. *Prerequisite: CHEM 270; prerequisite or corequisite: CHEM 331.*

**CHEM 480. Selected Topics in Chemistry.** 1-3 credits each semester.

This course is designed to allow an in-depth study of specific topics in chemistry selected according to student and staff interest.

**CHEM 481. Literature and Seminar I.** 1 credit.

Provides instruction in methods of abstracting specific information from the body of chemical literature. Attendance at regularly scheduled department seminars is required.

**CHEM 482. Literature and Seminar II.** 1 credit.

Provides practice in preparing and presenting a literature-based seminar and paper on a chemical topic. Attendance at regularly scheduled department seminars is required. *Prerequisite: CHEM 481 or permission of the instructor.*

**CHEM 494. Internship in Chemistry.** 1- 2 credits. May be repeated for a maximum of 6 credits.

Students participate in research or applied chemistry outside of the university. A proposal must be approved prior to registration, and a final paper will be completed.

**CHEM 497A, B, C. Undergraduate Chemical Research.** 2-4 credits, repeatable for a total of 6 credits.

Research in a selected area of chemistry, as arranged with and approved by a faculty research adviser the semester prior to registration.

**CHEM 499. Honors.** 6 credits.

Year course.