

# Professional Electives

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**QUIM 3085.** ENVIRONMENTAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

Effect of man's activities upon the biosphere, with particular emphasis on the chemistry of the processes involved.

**QUIM 3086.** ENVIRONMENTAL CHEMISTRY LABORATORY. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM 3055 or QUIM 3065. Corequisite: QUIM 3085.

Environmental chemical analysis providing practical experience in spectrophotometric, titrimetric, potentiometric, and chromatographic procedures used in water, air, and soil analysis. Field trips are required.

**QUIM 3335.** INTRODUCTION TO FOOD CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

Basic aspects of the relationships of food chemistry to health, nutrition, and industry.

**QUIM 4026.** HISTORY OF CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

The development of Chemistry from antiquity to the present time with an emphasis on the critical analysis of its concepts.

**QUIM 4037.** LABORATORY SAFETY: PRINCIPLES, PRACTICES, AND REGULATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3071 or QUIM 3461 or QUIM 3450 or QUIM 3142 or authorization of the Director of the Department.

Principles, procedures, techniques and methods to establish and transmit a safety culture in the science laboratory. Study from a chemical perspective of laboratory hazards. Emphasis on safe work practices, waste management, green chemistry, prevention, and accident management. Risk identification and management, and application of these concepts to real situations in compliance with regulatory agencies. Preparation and presentation of a safety project of an academic, industrial or government agency laboratory. Field trips to laboratory facilities required.

**QUIM 4115.** TEACHING PRACTICE IN THE CHEMISTRY LABORATORY. One to three credit hours. Four hours of practice per week per credit. Prerequisites: (QUIM 3072 or QUIM 3032 or QUIM 3450 or QUIM 3463) or (QUIM 3025 or QUIM 3055) and authorization of the Director of the Department.

Training in the teaching of chemistry, organization of a laboratory, handling of chemicals, care of equipment, safety rules and supervision of experimental and written work.

**QUIM 4137. INDUSTRIAL CHEMISTRY.** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3062 or QUIM 3463.

Chemical principles related to industrial processes, especially those being carried out in Puerto Rico. Field trips required.

**QUIM 4145. PRACTICE IN INDUSTRIAL CHEMISTRY.** One credit hour. One laboratory of four to six hours per week. Prerequisite: authorization of the Director of the Department.

Practical experience in Industrial Chemistry in cooperation with private industry or government.

**QUIM 4399. SELECTED TOPICS IN CHEMISTRY.** One to three credit hours. One to three hours of lecture per week. Prerequisite: third or fourth year student in Chemistry, or authorization of the Director of the Department.

Selected topics in Biochemistry, Organic Chemistry, Analytical Chemistry, Inorganic Chemistry, Physical Chemistry, and related areas.

**QUIM 4405. INTRODUCTION TO FORENSIC CHEMISTRY.** Three credit hours. Three hours of lecture per week. Prerequisites: QUIM (3055 or 3065) and QUIM (3461 or 3450 or 3071 or 3061); or authorization of the Director of the Department.

Study of the basic principles of forensic chemistry. Analysis of procedures, techniques, and applications of forensic chemistry as they relate to a crime investigation. Collection, examination, evaluation, and handling of physical evidence obtained after a crime. Description of analytical chemical methods, techniques, and instrumentation applied to forensic chemistry. Evaluation of criminal cases from a chemical perspective.

**QUIM 4997. CO-OP PRACTICE.** Three to six credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in chemistry in cooperation with industry or government agencies, jointly supervised by the Department, the COOP Program Coordinator, and an official from the cooperating organization.

**QUIM 4998. UNDERGRADUATE RESEARCH I.** One to three credit hours. Three to nine hours of research per week. Prerequisite: Authorization of the Director of the Department.

Introduction to chemical research under the supervision of professors of the department.

**QUIM 4999. UNDERGRADUATE RESEARCH II.** One to three credit hours. Three to nine hours of research per week. Prerequisite: three credits in QUIM 4998.

A research project under the supervision of professors of the department.

**QUIM 5005.** METHODOLOGY OF ENVIRONMENTAL CHEMICAL ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: ((QUIM 3055 or QUIM 3065) and (QUIM 3461 or QUIM 3450 or QUIM 3071)) or authorization of the Director of the Department.

Methods of chemical analysis used for environmental studies in monitoring air, water, and soil, including the methodology required by federal, state, and local agencies. Discussion of sampling techniques for air, surface and waste water, soil, and other matrices. Practical description of analytical instrumentation, quality control, and data analysis.

**QUIM 5065.** CHEMISTRY OF SYNTHETIC DRUGS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

The chemistry of synthetic organic compounds of medical and physiological interest. Topics to be covered will include anesthetics, antispasmodics, antipyretics, analgesics, hypnotics, sedatives, anticonvulsants, anticoagulants, antihistamines, tranquilizers, antimalarials, and anthelmintics.

**QUIM 5066.** TOXICOLOGICAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3063 or QUIM 3463 or authorization of the Director of the Department.

Chemical properties, reactions, origin, and the use of toxic substances, including chemical aspects of their effects upon biological systems, and their transformation and elimination.

**QUIM 5071.** GENERAL BIOCHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3463 or QUIM 3072 or QUIM 3450 or QUIM 3062 or authorization of the Director of the Department.

Chemical characterization of proteins, carbohydrates, lipids, and nucleic acids; principles of enzymology and bioenergetics; biological membranes and transport; recombinant DNA techniques; biological oxidations.

**QUIM 5072.** GENERAL BIOCHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 5071.

Biosynthesis and biodegradation of carbohydrates, lipids, amino acids, and nucleic acids; integration and regulation of animal metabolism; chemistry of genetic expression and regulation.

**QUIM 5073.** GENERAL BIOCHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Corequisite: QUIM 5071.

Isolation and characterization of proteins, lipids, and nucleic acids; enzymatic processes; the use of recombinant DNA techniques.

**QUIM 5074.** GENERAL BIOCHEMISTRY LABORATORY II. One credit hour. Four hours laboratory per week. Corequisite: MATE 3021 or MATE 3031 or MATE 3144 or MATE 3183.

The use of bioinformatics, structural genomics, and the molecular modeling in the spectroscopic characterization and analysis of biological molecules.

**QUIM 5085.** FOOD CHEMISTRY. Four credit hours. Three hours of lecture and four hours of laboratory per week. Prerequisite: QUIM 3072 and (QUIM 3463 or QUIM 3062) or authorization of the Director of the Department.

A study of the chemistry of the principal food resources and food additives, their role in nutrition, and the effect of processing treatments on their chemical composition.

**QUIM 5095.** NUCLEAR CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042) or (QUIM 3132 and QUIM 3134) and (MATE 3183 or MATE 3031 or MATE 3144).

A course describing the fundamental concepts of nuclear science. Selected topics on nuclear properties, nuclear forces and structure, radioactivity, mathematical relations of radioactive decay, statistics, nuclear reactions, effects of nuclear radiations and transitions, application of nuclear phenomena to chemistry and other related fields.

**QUIM 5105.** PRINCIPLES OF QUANTUM CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM4042 or authorization of the Director of the Department.

Conceptual development, postulates, and models of quantum mechanics. Approximation methods to the solution of the time-independent Schrödinger equation.

**QUIM 5125.** CHEMICAL THERMODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4042 or authorization of the Director of the Department.

Systematic analysis of the fundamental concepts of chemical thermodynamics and their applications.

**QUIM 5135.** PHYSICAL ORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 4042 and QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463.

A mathematical and quantitative study of organic chemical phenomena. Applications of modern theoretical concepts to the chemical and physical properties of organic compounds, and to the kinetics and mechanisms of organic reactions.

**QUIM 5145.** HETEROCYCLIC COMPOUNDS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

Structure, synthesis, and reactions of ring systems containing other atoms besides carbon. Alkaloids will be given special consideration.

**QUIM 5150.** SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

Elucidation of the structure of organic compounds by spectroscopic methods, including infrared, ultraviolet, nuclear magnetic resonance, and mass spectrometry techniques.

**QUIM 5165.** POLYMER CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3450 or QUIM 3072 or QUIM 3032 or QUIM 3463 or authorization of the Director of the Department.

Structure, properties, synthesis, reactions, and physical behavior of polymers. Experimental methods used in their analysis.

**QUIM 5175.** EXPLOSIVES DETECTION AND ANALYSIS. Four credit hours. Three hours of lecture and one four-hour laboratory period per week. Prerequisites: QUIM 4041 and (QUIM 3065 or QUIM 3055) or authorization of the Director of the Department.

General aspects, chemical and physical properties, and analytical techniques for the detection and analysis of explosives.

**QUIM 5205.** PHARMACEUTICAL ANALYTICAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3065 or QUIM 3055) and (QUIM 3072 or QUIM 3450) and QUIM 4041 or authorization of the Director of the Department.

Application of analytical methods and validation requirements oriented to pharmaceutical processes, materials, and regulations that apply to the pharmaceutical industry.