

**FOOD INDUSTRY
ENGINEERING PROGRAM
COURSE CATALOG**

COURSE DESCRIPTION

001 Communicative Competence

This course covers the fundamentals of reading comprehension, oral and written communication, taking into account the needs of different audiences. Explores strategies, organization, style, tone, illustration, and layout to design and construct a variety of documents for academic and professional settings. Prerequisite: Any prerequisite applies to the course.

002 Application of Information Technologies

Introduction to the use of computers to create and work on electronic documents, analyze and represent data from physical, biological and engineering sciences, and the use of electronic communications to transfer, receive and access information.

003 Appreciation of the Arts

This course supplies the theoretical tools needed to understand the fundamentals of theatrical frameworks and read cultural objects through open and critical means for the interpretation of visual, auditory and audio-visual works.

004 Environment and Sustainability

This module provides students with a knowledge of all the factors that affect the environment, and the resources and services provided by ecosystems. As such, this course receives input from the areas of natural sciences, health, social sciences and public policy. Through these subjects, there is an emphasis on the quantification of environmental problems in order for engineers to develop new solutions to problems, evaluate and improve existing systems for pollution prevention and clean-up, and anticipate the impact of human activities on natural systems.

005 The Profession in Social Context

This course provides an understanding of food industry professions in a social context, in which the food industry acts a basic component of modern society. Political, economic, ideological and individual relationships to the food industry will be analyzed in order to support students as they seek to take their place and assume an identity in the food engineering industry.

006 Ethics, Society and Profession

This course contributes to a well-rounded education by providing the knowledge for ethical reflection and the pursuit of the values, attitudes and principles promoted by UANL. Furthermore, it seeks to instill an ethos of personal development, civic ethics and responsible professional practice in the service of society, in a national and international context. The module situates the realms of ethics, society and profession as interrelated human performance spaces. Students are required to propose topics for decision-making and ethical analysis.

020 Regional Culture

This course provides students the opportunity to engage in investigatory studies of various cultural manifestations, fostering a sense of belonging and cultural identity within the process of globalization. The course encourages logical critical thinking within the principles of diversity, equality, respect, integrity, ethics and personal commitment to improve human living conditions. Students will also gain a knowledge of the environment and the local and external factors that affect regional development, so that as an individual or professional they will be able to act as agents of change in projects involving local, national and international participation.

022 Alternative Dispute Resolution Methods

This course in order a culture of peaceful resolution in UANL students, training professionals capable of contributing to the progress of society, in keeping with the values of change and progress defined by humanist principles a set out in the UANL 2012 Future Mission. The ADRM methods taught in this course have an everyday application, for the many occasions in which students will encounter conflicts of interests in their personal and professional lives.

023 Human Rights

This course provides students with an education on the role of human rights within a pluralistic and diverse society, in which all are required to practice values such as solidarity, justice and equality. Encouraging discussion and promoting respect for human rights through a holistic and humanistic education will support students to commit to these values not only in their professional lives, but also within the society in which they live.

040 Psychology and Professional Development

This learning unit emphasizes the acquisition of general knowledge for continuous personal and professional self-development. One of the main tasks of higher education is to prepare students to perform in the workplace, not only from the standpoint of theoretical concepts and practical skills, but also by providing spaces to consider and reflect on the professional choices available.

041 Human Development and Professional Competitiveness

This learning unit promotes a process of continuous growth and self self-improvement, through various experiential exercises and readings based on the theories of human development. The learning unit is divided into five phases designed to encourage student commitment to sustained personal growth.

042 Quality of Culture

This course lies within the selected topics on human development, health and sports within the University General Education Curriculum. The course provides students with the knowledge and tools to make a positive contribution to the UANL mission as embodied in its 2012 Future Vision. The course addresses both generic and specific skills for self-assessment and improvement, and for students to develop values and attitudes that will enhance their personal and professional lives.

Prerequisites: None

044 Gender Equality

This course provides an overview of the historical context of development in gender perceptions and gender theories in order to motivate student self-reflection and the development of critical analysis of cultural constructions of the meaning of being a man or a woman. Through the study and analysis of biological, psychological and socioeconomic theories used to explain the problems caused by gender differences, students will have the tools to identify these problems in context and propose formal solutions.

062 Enterprise Formation

This course seeks to instill a culture of taking the initiative, based on the development of individual capacities for innovation, creativity, leadership, teamwork and ethical, appropriate and responsible self-employment. Students will understand the importance of participating in projects with set goals, putting in use their knowledge, skills and attitudes to further the development of a globalized and competitive society. The course links scientific and technical expertise to the humanities, recognize the co-action of these fields in entrepreneurial development.

063 Intellectual Property and its Applications

This course provides a basic overview of the intellectual property system in Mexico, providing learning situations for students to become competent at detecting the viability and sustainability of efforts to protect research, literary and artistic works within the context of their academic and professional development.

081 English Culture

This unit is part of the Selected Topics on foreign languages and cultures of University General Education Curriculum. These topics provide space for students to develop the required competencies to interact efficiently through foreign languages. Approaching a culture through a foreign language is a social, economic and political process. Key features of the 21st century are a multicultural society, increased mobility, globalization and increased competition, alongside the search for new identities, the integration of cultural, political and economic processes, and international partnerships to open up and diversify markets. This learning unit is of interest to students who wish to gain knowledge on selected topics of English-speaking culture. It also represents an opportunity for those who want participate in an academic exchange and internships abroad.

083 Self-Care and Healthy Lifestyles

This course provides students with knowledge, skills and abilities for self-care in a culture that promotes their health, taking into account the following areas of study: psychosocial health, the environment, oral hygiene, nutrition, physical activity and prevention of drug abuse.

204 Comparative Biology

This course allows students to examine the organisms most relevant to agricultural activities, along with the sanitation, conservation and industrialization of food, highlighting their morphological characteristics, reproductive mechanisms, taxonomy and relative cultural and environmental importance.

212 Analysis of Heavy Metals in Foods

This course provides a basic knowledge of inorganic chemistry as applied to the quantitative analysis of specific heavy metals in consumer products, including the theoretical basis for the functioning of atomic absorption analysis equipment. Food analysis results are compared with the maximum permitted limits under national and international norms in order to establish compliance. The negative impacts of heavy metals on the environment, food and humans and their relationship to quality management and security are also discussed. Prerequisite: 402 Inorganic Chemistry

400 Biology

This course covers the relationship between molecular organization, cell structure and function, as well as biological processes related to the maintenance of homeostasis, cell division and replication, transmission and gene expression, emphasizing potential applications in biotechnology.

401 Mathematics

The course reviews the fundamentals of mathematical functions and their associated graphical models, identities and theorems of trigonometry and matrix algebra. A final term project on the application of mathematics in a real-life process or phenomenon is required.

402 Inorganic Chemistry

The course covers material phenomena, chemical equilibrium, quantitative and qualitative analysis, complex compounds, and instrumental analysis as background knowledge required for the courses 436-Organic Chemistry, 542-Physical Chemistry, and 543-Biochemistry.

403 Physics

The course covers Newtonian laws of work, energy and power; hydrostatic and hydrodynamic fundamentals and the principles of thermodynamics. Specifically, the course reviews the basic physical parameters of Pascal's law, Archimedes' principle, the continuity equation, Bernoulli's equation, Torricelli's theorem, transport phenomena, and Boyle's, Charles', Gay-Lussac's and Avogadro's laws.

404 Agricultural and Animal Production

This course covers the fundamental principles of agricultural production systems, in addition to animal science, livestock production and contemporary issues.

417 Anatomy and Physiology of Domestic Animals

In this course, students will learn the theoretical and practical basis of the anatomy and physiology of domestic animals, livestock production processes and their implications for sustainable management of natural resources. Students will be able to evaluate and diagnose agricultural production systems in order to improve productivity, learn to manage information technology and work collaboratively to build awareness of a sustainable society.

418 Anatomy and Morphology of Plants

This course covers the theory and practice of plant anatomy and morphology. Students will learn about the development of plant organs and the different functions they perform, in order to better understand the processes of plant production and transformation.

420 Economics

Economics is an essential discipline to understanding the world around us, while a knowledge of Agribusiness allows the conceptualization of all production phenomena and related factors. Together, these two courses provide students with an introduction to the general concepts of the world economy alongside concepts of supply and demand, markets and government functioning, addressing the issue of international competitiveness.

423 Microbiology

This provides a knowledge of microbial diversity and the biological characteristics of microorganisms (decomposers, pathogens and beneficial microorganisms), microorganism growing conditions, microorganism growth inhibition, laboratory techniques to identify microorganisms, and sanitary practices in microorganism control such as decontamination, disinfection and sterilization.

Prerequisite: 400 Biology

436 Differential Calculus

In this course, students will learn about the concepts and various types of mathematical functions. The student will understand the concepts of limits and continuity, which are essential in the development of calculus. The student will understand and be able to apply the concepts of change, derivatives, area under curve, integrals, and limits in sequences and series. This will enable students to apply the skills and knowledge required of professionals to research industrial processes. Prerequisite: 401 Mathematics.

438 Computer-Aided Designs

The course includes the use of the AutoCAD computer-aided design application, from a description of the interface, menus and tools, to editing and drawing procedures. Knowledge learned in this course includes: two-dimensional graphical methods for visualizing and communicating features of projects such as structures and objects using both traditional and computer-aided drafting and design techniques.

439 Organic Chemistry I

The objective of this course is to provide students with basic tools to understand carbon chemistry, covalent links, intermolecular forces, the artificial synthesis of compounds, and the role of functional groups in biological processes. This course links to the Biochemistry course to provide a basic understanding of carbon chemistry and general laboratory methodologies, along with all other courses that require an in-depth understanding of bio-systems. This course will help students to make use of formal scientific languages and understand and interpret scientific concepts. Prerequisite: 402 Inorganic Chemistry.

440 English I

In this course, the student learns the English language skills needed to interact in a social environment, the use of comparison and basic verb tenses.

443 Introduction to Agribusiness

In this course, students will learn of the various factors that may influence the action of food companies, based on the established principles of science, and techniques to analyze the performance of agricultural businesses. Students will be able to identify different types of companies, and apply basic knowledge of management, economics and quality management to determine areas opportunity or for improvement, while promoting the optimal use of resources.

452 Analysis of Foods for Human Consumption

This course provides an overview of methodologies for food analysis and about importance of establishing food quality in the food industry. Prerequisite: 402 Inorganic Chemistry.

456 Marketing of Agricultural and Animal Products

This course will educate students in the principles of agricultural marketing and differentiation, in addition to marketing systems used for the integration and strengthening of productive chains, and a knowledge of distribution systems. The course also covers the use and analysis of information from different markets for decision-making purposes.

Prerequisite: Economics.

457 Human Resources Management

This course educates students on human resource management practices as applied by companies. In addition to developing an awareness of the importance of human resources to companies and the effect of good administration, students will also analyze and discuss common personnel situations faced by supervisors. An emphasis is placed on the development of student attitudes, philosophical understanding, analytical abilities and problem solving skills within the working environment

459 Agro-Industrial Hygiene

Agro-industrial hygiene is a theoretical and practical course offered in the third semester, linked to all courses related to food conservation and safety. The course provides students with the basic tools needed to find information on, develop and implement sanitation standards in the food industry, in addition to regulations and risk agents. The course is linked to others such as Microbiology which are essential to understanding sanitation processes. Autonomous learning is promoted, along with the use of new technologies and critical thinking in particular. Students will be able to use formal scientific terminology to express, understand and interpret ideas. Prerequisite: 423 Microbiology.

484 Food Safety and HACCP

In this course, students will be shown how to establish the necessary procedures to develop a HACCP plan to ensure food safety through adherence to the regulations established by the NOM, NMX, Codex, FDA, USDA, etc. Students will learn about the principles of GMP and SSOP as a prerequisite for HACCP, and the use of vermin control programs. This course is related to the courses on Microbiology, Food Hygiene, Agribusiness and Organic

Chemistry, among others. Autonomous learning is encouraged, along with the use of new technologies and, primarily, the application of critical and scientific thought. Students will be able to use formal scientific language to make recommendations, understand and interpret ideas in the food industry. Prerequisite: 544 Industrial Microbiology.

536 Integral Calculus

The course reviews algebraic, trigonometric, logarithmic, and exponential functions, theorems and methods for integration, the chain rule, change of variables, integration by parts, trigonometric substitution, and integration methods for solid of revolution. Prerequisite: 436 Differential Calculus.

537 Statistical Methods

This course provides training in the basic statistical tools required for analytical studies, the optimization of processes and the analysis and interpretation of data in agricultural sciences and the food engineering industry. As part of the course, a research project must be planned and designed so that the results may be statistically validated and studied.

538 Organic Chemistry II

The course of Organic Chemistry II provides students with basic knowledge about the chemistry of carbon, covalent bonds, intermolecular forces, processes of artificial synthesis of compounds, and understanding of functional groups closely related with life processes. It contributes autonomous learning, the use of new technologies, and primarily the use of scientific thought. This course helps the student to use the logical, formal and mathematical language to express, understand, and interpret ideas. Prerequisite: Organic Chemistry I.

539 Food Microbiology

In this learning unit students acquire knowledge about foodborne (pollution and poisoning) diseases, implements preventive actions, and microbial control for food preservation. In addition, quality of food and beverages is evaluated according to microbiological and sensory methods. Prerequisites: 423 Microbiology.

540 English II

In this course, students learn to use the past, present perfect and future tenses, along with use of the infinitive, gerund, and adverbs indicating quantity and time. Additionally, they will learn how to express needs, suggestions and requests. Prerequisite: 440 English II.

541 Differential Equations

This course provides an overview of definitions and terminologies of differential equations, boundary value problems, the use of differential equations to solve mathematical problems, separable variables, linear equations, exact equations, linear and non-linear models, homogeneous and non-homogeneous equations, constant coefficients, undetermined coefficients, parameter variation, modeling with higher-order differential equations, and Laplace transformations. Prerequisite: 536 Integral Calculus.

542 Physical Chemistry

This course provides an overview of the fundamental properties of ideal gases, the first and second laws of thermodynamics, the physical transformation of substances, simple mixtures, phase diagrams, chemical equilibrium, electrochemistry and reaction kinetics. Prerequisite: 536 Integral Calculus.

543 Biochemistry

This course provides a general understanding of metabolism, metabolic pathways, enzyme kinetics, and the synthesis and degradation of biomolecules. This course provides the basis of several courses, including: Food Biochemistry; Food Biotechnology; Research and Development in the Food Industry; Cereal Science and Technology, Meat Science and Technology; Milk Science and Technology, and; Vegetable and Fruit Science and Technology. This course promotes autonomous learning, the use of technologies and, primarily, the application of scientific thought. This course enables students to use formal scientific terminology to express, understand and interpret ideas. Prerequisite: Organic Chemistry II.

544 Industrial Microbiology

This unit covers specific applications of Biotechnology in industrial processes involving the use of microorganisms. The course progresses according to the following phases: a) understanding industrial uses of microorganisms; b) basic concepts for the use of laboratory techniques and bioreactors to control microorganisms; c) appropriate biotechnological methods of product development. Prerequisite: 539 Food Microbiology.

545 English III

In this course, students learn to use the past, present perfect and future tenses, along with use of the infinitive, gerund, and adverbs indicating quantity and time. Additionally, they will learn how to express needs, suggestions and requests. Prerequisite: English II.

546 Material and Fluid Mechanics

This course will provide students and understanding of materials science as it relates to agronomic applications and the food industry, in terms of packaging and the mechanical handling of perishable items. Students will also learn of the fundamental principles of fluid mechanics and the methodologies used to apply them.

Prerequisite: Differential Equations (541).

547 Thermodynamics and Heat Transfer

This course provides an understanding of the fundamental concepts of energy exchange between the components of a system, and with its surroundings. A knowledge of concepts such as enthalpy, entropy, free energy, balance, etc., is required in order to describe heat treatment and cooling processes in the food industry, in addition to many other factors related to food engineering. The first law of thermodynamics applies to the quantity of energy present in a food, while the second law of thermodynamics is concerned with the efficiency of transforming energy between different states. The third law of thermodynamics supports concepts of temperature measurement in the analysis of reactions. Modes of heat transfer (conduction, convection and radiation) are also discussed,

in addition to the effects of geometry and time on heat transfer. Finally, the application of heat exchangers in the food industry is also covered.

548 Food Biochemistry

This course provides an overview of the biochemical components of food (water, proteins, enzymes, carbohydrates, lipids), their contribution to food organoleptic properties, and their behaviors during processing. This knowledge forms a basis to understand the preservation of fresh and processed food. This course is a precursor to courses on the Science and Technology of Cereals, Meat, Milk, and Fruits and Vegetables. Prerequisite: 543 Biochemistry.

549 English IV

The course overview the establishment and recognition of communicative interactions by tone patrons and conduct in an efficient way different activities of social and communicative situations; for instance, to talk about common situations and personal affairs, recognize different nuances on conversations and conferences related with academic subjects. In addition, the course will revise logical situations at different verbal modes to identify main ideas and specific information in social and academic manuscripts; and to write simple texts.

550 Rheology

This course introduces students to the use of rheology as a tool for quality assurance in food and food products. The focus of the course is on the basics and applications of the main rheology food tests, including analysis of the texture profile of solid and semi-solid foods (texture meter), liquid food viscosity (capillary, falling ball and rotary viscometers) and dough rheology (farinograph, extensograph, alveograph). Prerequisite: 546 Material and Fluid Mechanics.

551 Material and Energy Balance

The course provides an introduction to food engineering, major unit operations and flow diagrams to explain processes in the food industry. This includes procedures for calculating mass and energy balances in simple systems and accumulation, as well as heat transfer in processes such as evaporation and separation. Prerequisite: 541 Differential Equations.

552 Automatic Control Systems

This course covers control systems and instrumentation design, sensors and actuators, electronic interfaces, and identification systems. It also includes modelling and performance assessment, to cover the challenges of using modern tools and knowledge to develop new products and processes. In the final project, students must address the use of control and monitoring systems to automate and manufacture foods.

553 Food Biotechnology

This course provides knowledge of the molecular tools involved in the transformation of prokaryotic and eukaryotic cells, with the objective of obtaining qualities of interest to the food industry (production of new foods, colors, smells and tastes). Prerequisite: 548 Food Biochemistry.

554 Milk Science and Technology

This course covers the process of obtaining milk, the evaluation of quality, composition, microbiology, chemistry and biochemistry, in addition to heat-treatment and milk product creation processes. This knowledge will enable students to understand the milk industry, and support them in the development of new products and processes.

Prerequisite: 548 Food Biochemistry.

555 Unit Operations

This course provides an overview of unit operations so that students can better overcome common challenges faced by food engineers and scientists, including the development of new processes and products, equipment operation, the evaluation of microbial safety and nutritional content, the improvement of marketing strategies and packaging, compliance with federal and state food safety regulations, and the study of consumer feedback. Good teamwork and coordination is also required. Good teamwork and coordination are crucial in the food industry, therefore it is important to understand the various unit operations, how each is applied within food processing operations, the physics that underlie these operations and the advantages or limitations of each. The course establishes the basic principles of many food processing methods, including thermal pasteurization, separation, concentration and distillation, along with basic equipment components and their associated unit operations. Prerequisite: 551 Material and Energy Balance.

556 Science and Technology of Cereal

This course educates students in cereal industrialization processes based on their chemical composition, divided into primary and secondary industrialization processes. Topics covered include flour production, science and technology in bakery, the production of alcoholic beverages, corn syrups and biofuels.

Prerequisite: 548 Food Biochemistry.

557 Science and Technology of Fruits and Vegetables

This course provides an overview of the basic and applied science fundamentals behind the development of products based on fruits and vegetables, including juices, nectars, preserves, and the incorporation of permitted additives using technologies such as osmosis, concentration, vacuum, refrigeration, freezing and pickling, among others. Through this course, students will expand their analysis and raw material management skills.

Prerequisite: 548 Food Biochemistry.

558 Science and Technology of Meat

This course is taught in the seventh semester of the career of Food Industry Engineer and covers the biochemical principles of muscle development and its conversion into meat, the evaluation meat quality by pH, WHC, color and shear force, and the design of processes to create products such as sausages, smoked pork chops, chorizo, ham and salami. This will allow students to understand the meat industry, and support them to develop new products and processes to solve industry and consumer health needs. Prerequisite: 548 Food Biochemistry.

559 Research and Development in the Food Industry

The course examines the use of scientific methodologies in research and food products development. To complete the course, students must produce a research proposal (basic or applied), pursue it through laboratory experiments and finally present their results to the student community in a scientific paper and poster. Prerequisites: 556 Science and Technology of Cereals, 557 Science and Technology Fruits and Vegetables, and 558 Science and Technology of Meat.

560 Food Industry Design

This course is focused on the topic of packaging, labelling and marketing. It provides an overview of primary and secondary research methods for market analysis, identification of competitors and price-setting, in addition to estimated volume. The course also covers the identification of the physico-chemical, nutritional and sensory characteristics of raw materials and processed products, along with the technical basis for choosing raw material suppliers and the necessary equipment, establishing the dimensions required for the process. The technical and legal guidelines that determine industrial location are discussed, along with economic evaluation to detect the project break-even point. Prerequisite: 559 Research and Development in the Food Industry.

561 Thermal Processes of Food Preservation

This course establishes the basic concepts of energy exchange for food preservation, such as enthalpy, entropy, free energy, mass balance and energy and transfer phenomena. A knowledge of science and food technology is required to describe heat treatment and cooling processes, among other factors, in food engineering. As such, students will be familiar with the principal thermal processes that can be applied for food preservation, including pasteurization, sterilization, refrigeration and freezing, among others. Of these, cooling (refrigeration) is of greatest importance to the food industry and product quality processes.

562 Animal Production Systems

This course is taught in the fifth semester, covering the global process of livestock production systems, system evaluation, and the composition, microbiology, chemistry and biochemistry of meat. Students will be able to understand livestock production and supported to develop new opportunities for the production of safe and nutritious food.

563 Advanced Methods of Food Analysis

This course provides an understanding of inorganic chemistry and the theoretical basis of atomic absorption spectrometry, optical spectroscopy and colorimetry, as well as the knowledge required to operate these analytical instruments.

564 Transportation and Management of Perishable Food

This course covers the principal techniques of food storage and transportation, with the goal of preserving the quality of harvested agricultural products used in human food. This course is related to the courses on Chemistry and Food Production, Nutrition and Food Analysis. Students will learn about various techniques of harvesting, transporting and storing foods (fruits, vegetables, milk, egg, meat, seafood and processed foods such as sausages and dairy products). Prerequisite: 544 Industrial Microbiology.

565 Nutrition and Food

The objective of this course is to provide a knowledge of human nutrition and the consequences of deficient or non-controlled eating habits. Students will be able to identify the main health issues associated with poor nutrition, along with the benefits of a proper diet.

568 Food Packaging Technology

This course highlights the importance of packaging to the stability and shelf life of food products. Students will also acquire a knowledge of the logical methodology for the design, development and use of packaging to meet the needs of consumers and markets

569 Functional and Nutraceutical Foods

In this course, students will acquire a knowledge of functional foods and nutraceutical compounds present in foods, as a basis to understanding the importance and role in the health and food industry. Students will be able to apply knowledge previously acquired in other courses such as in order to develop functional and nutraceutical foods.

570 Project Development and Assessment

The course is divided into two sections. The first section includes project development topics with a focus on the concepts of strategic planning. The second section is focused in the financial evaluation and risk analysis of projects. Financial evaluation is based on the calculation of financial indicators such the net present value (NPV) and internal rate of return (IRR) together with their interpretation with a view to determining project viability. Thorough sensitivity analysis, students will be able to examine the project in different risk scenarios and evaluate possible responses.

571 Waste Management and Disposal

This course provides the basic theoretical knowledge for the proper handling and disposal of waste from industrial and agricultural food processes. This includes a general knowledge of waste management and solid waste disposal techniques, a general knowledge of liquid waste and atmospheric emissions. Additionally, students will learn management skills and self assessment, contributing both to conceptual and procedural elements of the use of innovative and relevant resources to promote learning.

573 Sensory Evaluation of Foods

In this course, students will learn to use current methods of sensory evaluation for the development of new food products, quality control, maintenance of processed food sensory properties, the monitoring of food competition and determination of shelf life. This course is related to those on the Science and Technology of Cereals, Meat, Milk and Fruits and Vegetables, in addition to Statistical Methods. Therefore, this course forms the basis for competence in food innovation, quality management and food safety, in addition to the provision of advice for the food industry.

574 Environmental and Risk Management

This course provides students with the basic theoretical knowledge to predict the damage caused by the improper operation of industrial processes or hazardous chemicals and the application of control measures.

655 Water Sampling and Analysis

This is a practical course focusing on the determination of key parameters in municipal wastewater. This course is taught following courses on Analysis of Heavy Metals in Food and Food Analysis for Human Consumption in the third and fourth semesters. In this course, students will learn how to perform the physical, chemical and biological analysis of wastewater, then to interpret results in comparison with Mexican standards. Prerequisite: 402 Inorganic Chemistry and 4023 Microbiology.