COURSES OF INSTRUCTION

OFFICE OF THE DEAN OF ACADEMIC AFFAIRS

Interdisciplinary Courses

INTD 3355. RESEARCH METHODS IN LIBRARIES. Three credit hours. Three hours of lecture per week.

Organization and services of libraries with emphasis on the Library of the Mayagüez Campus of the University of Puerto Rico. Selection, evaluation, and use of bibliographic resources in print and non-print format; conventional research strategies through print resources; development of new research strategies through electronic formats.

INTD 3357. ENVIRONMENTAL SUSTAINABILITY. Three credit hours. Three hours of lecture per week.

The course discusses the most relevant issues related to the goals, principles, and practical applications of sustainability from the perspectives of science and engineering, businesses, and their policies.

INTD 3706. TECHNOLOGY, WELLBEING AND JUSTICE. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

The course examines practices of technology innovation and design, and conceptions of human progress. The development of skills in critical scientific and philosophical reasoning to critique contemporary technological cultures. Compare alternative technological options oriented towards achieving sustainability and fostering human wellbeing in communities.

INTD 3990. SELECTED TOPICS WITH MULTIDISCIPLINARY APPROACHES. One to nine credit hours. One to nine hours of lecture per week.

Study of topics or contemporary problems with a multidisciplinary approach. This course has a general education perspective.

INTD 3995. EXPERIENCE IN COMMUNITY DEVELOPMENT. One to six credit hours. Three to eighteen hours of workshop per week.

Design and implementation of community projects in coordination with the University Institute for Community Development. Field trips and team work required.

INTD 4000. CONGRESSIONAL INTERNSHIP-CÓRDOVA PROGRAM. Nine credit hours. A minimum of thirty-five and a half hours per week for fifteen weeks during the semester. Prerequisites: authorization of the Institutional Coordinator for the Córdova Program and to be selected as participant by the joint Commission for the Córdova Program in the state Legislature of the Commonwealth of Puerto Rico. Corequisite: INTD 4010.

Internship in the Congress of the United States of America. Supervised work experience in the office of a congressman or any other congressional office such as the Library, the Office for Science and Technology, and the offices of congressional committees or subcommittees.

INTD 4010. ACADEMIC SEMINAR-WASHINGTON CENTER. Three credit hours. Three hours of lecture per week for fifteen weeks during the semester. Prerequisites: authorization of the Institutional Coordinator for the Córdova Program and to be selected as participant by joint Commission for the Córdova Program in the state Legislature of the Commonwealth of Puerto Rico. Corequisite: INTD 4000.

Academic complement to the Congressional Internship. The student selects a seminar type course in his academic or professional area of interest among those offered by experts through the Washington Center each semester.

INTD 4019. APPLICATIONS OF SOCIAL SOFTWARE FOR EDUCATION. Three credit hours. Three hours of lecture per week.

Critical analysis of the socio-technological systems, mostly based on the Internet, that fosters human expression, communication and collaboration.

INTD 4995. INSTITUTIONAL COOP PLAN. Zero to nine credit hours. Six to ten weeks during the summer or twelve to fifteen during the semester, depending on the required duration of the internship. Requisites: to have approved one full year as a regular student before the internship begins. To have applied to the government agency, private enterprise or foundation of his (her) choice, and to have complied with the requisites established by it. To have been selected by the host government agency, private enterprise or foundation.

Work experience supervised and evaluated by a faculty member in coordination with a government agency, private enterprise or foundation, according to the student's academic background and work requirements.

INTD 5001. MULTIDISCIPLINARY ARCHAEOLOGY I. Three credit hours. Two hours of lecture and two hours of laboratory per week.

Introduction to the systematic description of archaeological data, their recording procedures, analysis, and methodical synthesis of the information obtained. Includes the analysis of material remains using approaches and techniques from diverse disciplines of the natural sciences and engineering. Organized in modules of archaeometry, analysis of archaeological materials, and synthesis of archaeological data.

INTD 5002. MULTIDISCIPLINARY ARCHAEOLOGY II. Three credit hours. Two hours of lecture and one two hours of laboratory per week. Prerequisite: INTD 5001 or authorization of the Director of the Department.

Introduction to archaeological research in Puerto Rico and the Caribbean from a multidisciplinary perspective. Includes the study of archaeological sites and regions using approaches and techniques from diverse disciplines of the natural sciences and engineering. Organized in modules of introduction to archaeological theory; survey and remote sensing; excavation and geoarchaeology.

INTD 5095. APPROPRIATE TECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

General overview of technology from historical and philosophical viewpoints. Critical examination of choice inherent in technology. Traditional and new definitions of appropriate technology. Challenges and best practices to apply engineering and technology to underserved, under-funded, or wrong-development communities.

DEPARTMENT OF AEROSPACE STUDIES

ESAE 3001. HERITAGE AND VALUES OF THE AIR FORCES I. Two credit hours. One hour of lecture and one and a half hours of leadership laboratory.

Overview of the basic characteristics, missions, organization, traditions, and values of the United States Air and Space Forces.

ESAE 3002. HERITAGE AND VALUES OF THE AIR FORCES II. Two credit hours. One hour of lecture and one and a half hours of leadership laboratory.

Overview of the basic characteristics, missions, organization, traditions, and values of the United States Air and Space Forces.

ESAE 3011. TEAM AND LEADERSHIP FUNDAMENTALS I. Two credit hours. One hour of lecture and one and a half hours of leadership laboratory.

Study and practice of the fundamentals of leadership and team building. Preparation for field training and leadership positions in the detachment.

ESAE 3012. TEAM AND LEADERSHIP FUNDAMENTALS II. Two credit hours. One hour of lecture and one and a half hours of leadership laboratory.

Study and practice of the fundamentals of leadership and team building. Preparation for field training and leadership positions in the detachment.

ESAE 4001. LEADERSHIP AND EFFECTIVE COMMUNICATION IN THE AIR FORCES I. Four credit hours. Three hours of lecture and one and a half hours of leadership laboratory.

Study and practice of communication strategies, emphasizing its importance as leaders. Students will have an opportunity to serve as leader and manage techniques in a supervised environment as juniors and seniors.

ESAE 4002. LEADERSHIP AND EFFECTIVE COMMUNICATION IN THE AIR FORCES II. Four credit hours. Three hours of lecture and one and a half hours of leadership laboratory.

Study and practice of communication strategies, emphasizing its importance as leaders. Students will have an opportunity to serve as leader and manage techniques in a supervised environment as juniors and seniors.

ESAE 4011. NATIONAL SECURITY AND COMMISSIONING PREPARATION I. Four credit hours. Three hours of lecture and one and a half hours of leadership laboratory.

Preparation for the role as military officers and its direct link to the National Security Strategy. General overview of the social and political issues the college level military profession faces.

ESAE 4012. NATIONAL SECURITY AND COMMISSIONING PREPARATION II. Four credit hours. Three hours of lecture and one and a half hours of leadership laboratory.

Preparation for the role as military officers and its direct link to the National Security Strategy. General overview of the social and political issues the college level military profession faces.

DEPARTMENT OF MILITARY SCIENCE

CIMI 3011. INTRODUCTION TO MILITARY SCIENCES. Two credit hours. One hour of lecture and one two-hour drill period per week.

Introduction to the Basic Military Science concepts and principles. A brief history of the U.S. Army ROTC program. Emphasis on principles of leadership and land navigation.

CIMI 3012. BASIC MILITARY SKILLS. Two credit hours. One hour of lecture and one two-hour drill period per week.

Training in Basic Military skills such as First Aid, Physical Fitness, Military Drill, and Ceremony, and Land Navigation using a map and compass. Emphasis on the development of leadership and basic military knowledge.

CIMI 3021. FUNDAMENTALS OF MILITARY TACTICS I. Two credit hours. One hour of lecture and one two-hour drill period per week.

Study of basic military tactics at the squad level. Introduction to military geography and land navigation. Advanced techniques in the improvement of oral expression. Leadership laboratory.

CIMI 3022. FUNDAMENTALS OF MILITARY TACTICS II. Two credit hours. One hour of lecture and one two-hour drill period per week.

Continuation of basic military unit tactics. Principles of military strategies. Study of military formations, support and communication.

CIMI 3041. BASIC ENGLISH FOR TODAY'S ARMY I. One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated a limited proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English Language proficiency test. Emphasis is on pronunciation, reading comprehension, vocabulary, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

CIMI 3042. BASIC ENGLISH FOR TODAY'S ARMY II. One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated a limited proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English Language proficiency test. Emphasis is on pronunciation, reading comprehension, vocabulary, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

CIMI 3043. INTERMEDIATE ENGLISH FOR TODAY'S ARMY I. One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated an intermediate level of proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Emphasis is on aural comprehension, speaking proficiency, pronunciation, vocabulary building, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

CIMI 3044. INTERMEDIATE ENGLISH FOR TODAY'S ARMY II. One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated an intermediate level of proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Emphasis is on aural comprehension, speaking proficiency, pronunciation, vocabulary building, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

CIMI 3051. MILITARY BRIEFING I. Two credit hours. Two hours of lecture, seminar or practical exercises per week.

Designed for third year Military Science students who have demonstrated certain ability or dexterity in the English language as a result of the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Practice in military briefings, with special emphasis on formal and informal outlines, and the correct use of military visual aids. Leadership evaluation, including an acculturation seminar. To be taken only as a free elective.

CIMI 3052. MILITARY BRIEFING II. Two credit hours. Two hours of lecture, seminar or practical exercises per week.

Designed for third year Military Science students who have demonstrated certain ability or dexterity in the English language as a result of the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Practice in military briefings, with special emphasis on formal and informal outlines, and the correct use of military visual aids. Leadership evaluation, including an acculturation seminar. To be taken only as a free elective.

CIMI 4011. COMMUNICATION AND PSYCHOLOGY OF MILITARY LEADERSHIP. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; additionally, a three-day field training exercise, plus the six week Advanced Camp at Fort Bragg, North Carolina.

Advanced course on communication techniques, both oral and written. Development of leadership by case studies and problems analysis that require psychological techniques. Army organization. Leadership laboratories.

CIMI 4012. FUNDAMENTALS OF MILITARY STRATEGY. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; additionally, a five-day field training exercise, plus the six week Advanced Camp at Fort Bragg, North Carolina.

Study of the principles and fundamental premises in the development of military strategy. Command-staff functions and responsibilities in each level of command. Study of the principles for defense of a country. Leadership laboratories.

CIMI 4021. MILITARY HISTORY, LEADERSHIP AND MILITARY ADMINISTRATION. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; and a three-day field training exercise.

Army writing style. Military administration. Compendium of military and world history from the war principles to the basic military movements, the Spanish American War, World War I, II, Korea and Vietnam. Leadership Laboratory.

CIMI 4022. SEMINAR: LEADERSHIP AND MILITARY ADMINISTRATION. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; and a five-day field training exercise.

Analysis of leadership problems. Study of the administration of units and military personnel. Basic military justice, logistics management, command and staff responsibilities, duties and responsibilities of Army officers. Leadership laboratory.

CIMI 4041. MILITARY WRITING I. Two credit hours. Two hours of lecture, seminar, case studies, or practical exercises per week.

Designed for Military Science students who wish to improve their military writing skills in English. Emphasis on military writing styles and formats. Topics include military memorandums, autobiographies, military history analysis, and a military ethics paper. To be taken only as a free elective.

CIMI 4042. MILITARY WRITING II. Two credit hours. Two hours of lecture, seminar, case studies, or practical exercises per week.

Designed for Military Science students who wish to improve their military writing skills in English. Emphasis on military writing styles and formats. Topics include military memorandums, autobiographies, military history analysis, and a military ethics paper. To be taken only as a free elective.

TEACHER PREPARATION PROGRAM (TPP)

Special Education

EDES 3205. ASSISTIVE TECHNOLOGY IN SPECIAL EDUCATION. Three credit hours. Three hours of lecture per week.

Analysis of the fundamental practices of assistive technology for the education of people with disabilities. Analysis of the integration of assistive technology in education and within the family environment, as well as in terms of service models and the process of evaluation and identification of students' needs. Field experience is required.

EDES 4006. NATURE AND NEEDS OF EXCEPTIONAL LEARNERS. Three credits. Three hours of lecture per week.

This course offers a overview of the psychological and educational needs of exceptional learners. It provides the experiences and knowledge necessary for the design and implementation of curricular programs, special teaching techniques, and strategies appropriate for exceptional learners. Laboratory and field experiences will be an integrate part of the course.

EDES 4048. BEHAVIOR MODIFICATION APPLIED TO A CLASSROOM SETTING. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006.

Analysis and management of the principles and techniques for altering, changing and modifying abnormal, inappropriate, and deviant behavior associated with the teaching-learning process.

EDES 4055. EDUCATIONAL STRATEGIES FOR THE INCLUSION OF STUDENTS WITH SPECIAL NEEDS IN THE REGULAR CLASSROOM. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006.

Study in the practical aspect of the teaching-learning process for students with disabilities in the regular classroom. Description of the planning process while considering the individual differences of students. Preparation of materials adapted to a wide array of human capabilities, development of educational strategies directed towards properly managing the context of diversity, and perspectives of universal design for learning and differentiated instruction.

EDES 4077. COMMUNICATION TECHNIQUES FOR THE HEARING IMPAIRED. Three credit hours. Three hours of lecture per week.

Application of basic sign language including spelling and common signs, specifically for the puerto rican population. Evaluation of the historical aspects and rules to maintain effective communication with a deaf person.

EDES 4096. METHODS IN TEACHING READING AND WRITING IN SPECIAL EDUCATION K-12. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006.

Application of practical and fundamental theories of how exceptional children and youngsters learn to read and write. The course uses the Spanish State Curriculum at the elementary, middle, and secondary levels. Design and application of appropriate methods and strategies used for special populations considering the goals and objectives included in the individualized education program (IEP), unit plans, materials, assistive technology, and assessment.

EDES 4097. LANGUAGE ART METHODS IN SPECIAL EDUCATION K-12. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006.

Application of the language arts (listening, speaking, reading and writing) to special education. Examination of the methods and remedial strategies appropriate for exceptional student's that facilitate the opportunity to expand the student's ability to identify, solve and make assertive decisions.

EDES 4098. METHODOLOGY OF TEACHING MATHEMATICS IN SPECIAL EDUCATION K-12. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006- Nature and Needs of Exceptional Learners.

This course prepares the teacher candidate in the process of teaching mathematics to children and youth with disabilities in the mathematics curriculum in the elementary and secondary levels. Formal and informal tests for the diagnosis, methods and strategies used in teaching mathematics are examined. It takes into consideration writing measurable goals and objectives of the service program (PEI) in the area of mathematics. It works on the design of how to plan a unit, including the preparation of teaching materials, technological assistance and assessment of learning. The information competencies will be integrated to the course content, which will provide the student the opportunity to develop the skills to identify their need for information to offer (search) alternatives, make informed decisions and solve problems correctly, according to the course content. Finally, the student applies the acquired knowledge through an educational intervention.

EDES 4125. AUTISM: PSYCHOLOGICAL & NEURO-BIOCHEMICAL ASPECTS. Three credit hours. Three hours of lecture per week. Prerequisite: EDES 4006.

Analysis of autism from birth to adulthood. Explanation of the historical background of its studies and theoretical foundations included in state and federal laws and the public policy to protect the rights of this population. Evaluation of the characteristics and current definitions that correspond to established protocols in the area of mental health. Analysis of the possible causal factors of the condition, such as psychological, neurological, biochemical and exogenous, and the identification of the role of various health professionals in the diagnosis, epidemiology and treatment of autism. Analysis of the accommodations, technology support, and educational practices appropriate for this population.

Education Foundations

EDFU 3007. SOCIAL FOUNDATIONS OF EDUCATION**.** Three credits. Three hours of lecture per week.

Analysis of the basic social science principles in terms of the educational process. Study and discussion of the social problems that have conditioned the development of education in Puerto Rico.

EDFU 3011. FOUNDATIONS OF HUMAN DEVELOPMENT. Three credit hours. Three hours of lecture per week.

Analysis of the fundamentals of cognitive, social, emotional, and physical development in the human life cycle, addressing particularly the period of adolescence. Classifies and analyzes the different paradigms associated with these areas of development from the holistic perspective and examines the implications of these in Puerto Rico.

EDFU 3012. FOUNDATIONS OF EDUCATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week.

An analysis of the psychological theories, research and innovations which explain the learning and thinking processes in the school context. The course examines the basic concepts of the behaviorist, cognitive, socio-cultural, and humanist theories related to school teaching, motivation, diversity and school life. An analysis of the application to educational practice in contemporary Puerto Rican society is a part of the course. Field experience is required in a school setting.

EDFU 3017. EVALUATION OF LEARNING. Three credit hours. Three hours of lecture per week.

To create consciousness on the part of the student-teacher towards the philosophy of evaluation as a part of the educational process and to promote a knowledge of the quantitative and qualitative techniques of evaluation and their uses. The evaluation techniques will be analyzed and practice will be offered in the development of valid and reliable evaluation

instruments to identify, stimulate, predict and guide the student's behavioral characteristics. This course also includes the organization, presentation and statistical analysis of the results as presented by the evaluation instruments and the interpretation of this data to make intelligent decisions in relation to teaching strategies.

EDFU 3055. LEGAL FOUNDATIONS OF EDUCATION. Three credit hours. One and a half hour of lecture and one and a half hour of discussion per week.

Legal aspects related with the over-all process of Education the teachers, the students and the community are examined and analyzed. Two analytical models or schemes will be used: the hierarchy of norms and the jurisprudence.

EDFU 4006. THE CHILD AND HIS SOCIAL MILIEU. Three credits. Three hours of lecture per week.

Study of the child from the social and cultural viewpoints; analysis of the social forces and their effects on human behavior; the socializing function of the more important agencies; and their contribution to the realization of educational objectives.

EDFU 4019. PHILOSOPHICAL FOUNDATIONS OF EDUCATION. Three credits. Three hours of lecture per week.

Study of philosophic theory and its relation to pedagogical practice. Presentation of major problems that have been caused by conflicting educational philosophies in terms of their historical development and their present day impact. The course emphasizes and clarifies the role of the teacher in regard to educational goals, curriculum programs, and evaluation. Basic philosophical problems such as the meaning of truth and knowledge; the relation between knowledge and action; the nature of beauty, truth, happiness; and their educational implications are analyzed. The course also endeavors to promote an understanding of the way in which the development of the scientific method, the progress of democracy, changes in social and economic institutions, and the advance of human knowledge demand changes in philosophical attitudes as well as in all educational practice.

EDIN 4005. TEST AND MEASUREMENTS FOR INDUSTRIAL VOCATIONAL EDUCATION. Three credit hours. Three hours of lecture per week.

A course designed to develop knowledge of the relationship between scientific evaluation and effective teaching in industrial vocational education. The essential principles of psychometry as applied to shop courses; the construction, administration, interpretation, and application of achievement, performance, and aptitude tests; the organization and presentation of evaluative data; and the conversion of raw scores to letter or standard grades as used in school system of Puerto Rico.

EDIN 4029. SHOP ORGANIZATION AND MANAGEMENT. Three credit hours. Three hours of lecture per week.

A course designed to offer an opportunity for the discussion of problems related to shop organization and management. Includes practices and procedures in the field of industrial education; types of shop organization, layouts and housing ,light, ventilation, equipment, supplies, inventories and requisitions; community needs; records and reports, safety procedures; organization of activities, student control, and other shop administrative problems in Vocational Industrial Education.

EDPE-EDUC-TEED 3077. INTEGRATION OF TECHNOLOGY IN EDUCATION WITH DISTANCE AND VIRTUAL TEACHING STRATEGIES. Three credit hours. Three hours of lecture per week.

Introduction to the use of current and emerging technologies in the teaching and learning processes. Study of the concepts and theories that best explain the learning process through technological means; the most effective principles of distance education (synchronous, asynchronous and mixed), hybrid teaching and with a combined population.

EDPE 3129. THE USE OF MICROCOMPUTERS IN THE CLASSROOM. Three credits. Three hours of lecture per week.

Introductory courses on the role of microcomputers in the classroom. Special emphasis will be given to the use of Microcomputers in the school setting, resources that are available to the classroom teacher and how to integrate computers to teaching. Workshop experiences and special assignments will complement class discussions.

EDPE 4047. THEORY AND METHODOLOGY IN THE TEACHING OF COMPUTER TYPING SKILLS. Three credit hours. Three hours of lecture per week. Prerequisites: EDFU 3002 or EDFU 3012 or authorization of the Director of the Department.

This course will equip the student with the required competencies for directing the acquisition of occupational typing skill.

EDPE 4059. THEORY AND METHODOLOGY IN THE TEACHING OF BUSINESS SUBJECTS AND COMPUTER TYPING SKILLS IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and fifteen hours of laboratory experiences. Prerequisites: ((EDFU 3001 or EDFU 3011) and (EDFU 3002 or EDFU 3012)) and EDFU 3007 and EDFU 4019 and authorization of the Director of the Department. Corequisites: EDFU 3017 and EDPE 3129.

The course will prepare the students in the Methodology of Teaching Business Subjects and computer typing skills. It will reinforce the cognitive, affective and motor skills. Studies of theories, general procedures in teaching development, selecting and preparing teaching materials for business subjects and computer typing classes will be discussed. Various forms of evaluating student's progress will be integrated into the necessary elements in the development of necessary skills in this process.

EDPE 4060. CURRICULUM AND METHODOLOGY OF THE INTEGRATION OF TECHNOLOGY IN EDUCATION. Four credit hours. Four hours of discussion per week. Prerequisite: 15 credits approved in TEED course.

Development of professional skills to integrate technology in education. Training in methods and strategies to direct the learning of skills related to the integration of technology in education. These skills will be developed through the study and analysis of the fundamental components to integrate technology in education. Synchronous and asynchronous individual and group activities will be carried out; readings will be analyzed, specialized projects, presentations, case discussions and preparation of unit plans and diaries will be carried out.

EDPE 4135. THEORY AND METHODOLOGY IN THE TEACHING OF SCIENCE IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture per week.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Science in Secondary School are Studied: Planning, Innovative Education and Curriculum Analysis; Basic Content in this area of Specialization, Preparation, Adaptation and Utilization of Resources; Methodology, Teaching Techniques and Strategies; Fundamentals of Measurement and Evaluation. These contents are integrated on a Practical Basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican Educational problems.

EDPE 4136. STUDENT TEACHING OF GENERAL SCIENCE IN SECONDARY SCHOOL. Six credit hours. Six hours of lecture per week. Prerequisite: EDPE 4135.

The course requires that teacher candidates lead the process of learning and teaching in a public or private, that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A university professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the university as schedule in the semester calendar.

EDPE 4145. THEORY METHODOLOGY TEACHING MATHEMATICS SECONDARY SCHOOL. Three credit hours. Three hours of lecture per week.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Mathematics in Secondary School are Studied: Planning, Innovative Education and Curriculum Analysis; Basic Content in this area of Specialization, Preparation, Adaptation and Utilization of Resources; Methodology, Teaching Techniques and Strategies; Fundamentals of Measurement and Evaluation. These contents are integrated on a Practical Basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican Educational problems.

EDPE 4155. THEORY AND METHODOLOGY IN THE TEACHING OF HISTORY AND SOCIAL STUDIES IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture per week.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of History and Social Studies in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes Puerto Rico educational problems.

EDPE 4165. THEORY AND METHODOLOGY IN THE TEACHING OF ART (K-12). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Arts in K-12 School are Studied: Planning, Innovative Education and Curriculum Analysis; Basic Content in this area of Specialization, Preparation, Adaptation and Utilization of Resources; Methodology, Teaching Techniques and Strategies; Fundamentals of Measurement and Evaluation. These contents are integrated on a Practical Basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rico Educational problems.

EDPE 4185. THEORY AND METHODOLOGY IN THE TEACHING OF THEATRE (K-12) Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Theatre in K-12 School are Studied: Planning, Innovative Education and Curriculum Analysis; Basic Content in this Area of Specialization, Preparation, Adaptation and Utilization of Resources; Methodology, Teaching Techniques and Strategies; Fundamentals of Measurement and Evaluation. These contents are integrated on a Practical Basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican Educational problems.

EDPE 4215. THEORY AND METHODOLOGY IN THE TEACHING OF PHYSICAL EDUCATION IN K TO 12. Three credit hours. Three hours of lecture and fifteen hours of laboratory experiences. Prerequisites: authorization of the Director of the Department and EDFI 4205. Corequisite: EDPE 3129.

Theoretical and practical approach to the appropriate methodology to the teachinglearning process of physical education in k to 12 school. Includes basic content and curriculum analysis, utilization of resources; planning, as well as teaching, measurement and evaluation techniques and strategies (all contents are integrated on a practical basis). All students must complete at least 15 hours of supervised laboratory experiences in secondary schools. This will enable students to develop critical, dynamic, and creative attitudes toward Puerto Rican educational problems.

EDPE 4218. THEORY AND METHODOLOGY IN TEACHING ELEMENTARY PHYSICAL EDUCATION. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: EDFI 4179, EDFI 4205. Corequisite: EDFI 3106.

Study of the theoretical and practical approaches to the teaching-learning process in elementary school physical education. Development of the knowledge, materials, and skills required for planning, preparing, and providing instruction. Study of learning theories, teaching methods and techniques, curricular analysis, and evaluation and assessment methods in the classroom and outdoor settings. Thirty (30) hours of laboratory experience in public or private schools are required.

EDPE 4235. METHODOLOGY TEACHING SPANISH SECOND LANGUAGE. Three credit hours. Three hours of lecture per week.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Spanish in Secondary School are Studied: Planning, Innovative Education and Curriculum Analysis; Basic Content in this Area of Specialization, Preparation, Adaptation and Utilization of Resources; Methodology, Teaching Techniques and Strategies; Fundamentals of Measurement and Evaluation. These contents are integrated on a Practical Basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican Educational problems.

EDPE 4245. THEORY AND METHODOLOGY IN THE TEACHING OF ENGLISH (K-12). Three credit hours. Three hours of lecture and fifteen hours of practice per week. Prerequisites: (EDFU 3012 and EDFU 3007 and EDFU 4019) or authorization of the Director of the Department. Corequisite: INGL 5010.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of K-12 English are studied: planning, innovative education and curriculum analysis, basic content in this area of specialization, preparation, adaptation and utilization of resources, methodology, teaching techniques and strategies, as well as measurement and evaluation fundamentals. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experience in public and private schools. These experiences will enable the students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4137. PRACTICUM IN TEACHING BIOLOGY IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4138. PRACTICUM IN TEACHING OF GENERAL PHYSICS IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4135 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4139. PRACTICUM TEACHING OF GENERAL CHEMISTRY SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4135 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4146. STUDENT TEACHING OF MATHEMATICS IN SECONDARY SCHOOL**.** Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4145 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4156. STUDENT TEACHING OF SOCIAL STUDIES IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisite: authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4157. PRACTICUM IN TEACHING GENERAL HISTORY IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisite: authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4166. PRACTICUM IN TEACHING OF ART IN K-12 SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4165 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4186. PRACTICUM TEACHING OF THEATER IN K-12 SCHOOL. Six credit hours. One hour of lecture and twenty hours of supervised practice per week. Prerequisite: EDPE 4185.

The course requires that teacher candidates lead the process of learning and teaching in a public or private school; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends 4 hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4187. PRACTICUM IN TEACHING OF BUSINESS EDUCATION IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisite: authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4216. PRACTICUM IN TEACHING PHYSICAL EDUCATION. Six credit hours. Three hours of seminar and twenty hours of supervised practice per week. Prerequisites: EDPE 4215 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private school; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A university professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends four hours daily to the school and three hours to the seminar at the university as schedule in the semester calendar.

EDPE 4236. PRACTICAL IN TEACHING OF SPANISH IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4235 and authorization of the Director of the Department.

The course requires that teacher candidates lead the process of learning and teaching in a public or private; that they participate in school activities and attend seminars offered at the University of Puerto Rico. Through these experiences teacher candidates are equipped with theories, practical techniques and methods to develop their knowledge, skills and attitudes that contribute to improvements in practicum. In addition, we discuss and analyze current topics in the field of study or situations that arise during their practicum. A University professor, a cooperating teacher and the school principal supervise the teacher candidate. The teacher candidate attends fours hours daily to the school or the seminar at the University as scheduled in the semester calendar.

EDPE 4246. STUDENT TEACHING OF ENGLISH IN SECONDARY SCHOOL. Six credit hours. One hour of lecture per week and twenty hours of supervised practice per week. Prerequisites: EDPE 4245 and authorization of the Director of the Department.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching English and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory student will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4301. MONTESSORI GENERAL METHODOLOGY FOR PREADOLESCENTS AND ADOLESCENTS. Three credit hours. Three hours of lecture per week. Prerequisite: EDUC 3005.

Introduction to the Montessori pedagogical and methodological principles applied to the higher elementary and adolescent levels to design effective learning environments and foster the holistic development of students.

EDPE 4302. CONTENT AND APPLIED METHODOLOGY IN MONTESSORI SECONDARY EDUCATION WITH THE INTEGRATION OF MATHEMATICS, LANGUAGE, HISTORY, GEOGRAPHY, ARTS, AND MOVEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: (EDUC 3005 and EDPE 4301) or authorization of the Director of the Department.

Application of methods for content teaching in Montessori courses for upper elementary and secondary level, focusing on math, geometry, Spanish (reading and writing, grammar and spelling), geography, history, arts, music, theater, and movement.

EDUC 3005. FOUNDATIONS OF THE MONTESSORI TEACHING PHILOSOPHY. Three credit hours. Three hours of lecture per week.

Introduction to the philosophy of Montessori education. The central concepts and principles of the Montessori philosophy, as well as its relationship to educational theory and practice, will be examined.

EDUC 3006. INTEGRATION OF MONTESSORI CURRICULUM AND EFFECTIVELY MANAGEMENT OF LEARNING ENVIRONMENTS FOR PREADOLESCENTS AND ADOLESCENTS. Three credit hours. Three hours of lecture per week.

Study of Montessori education for preadolescents and adolescents, with a focus on integrating curriculum and effectively managing learning environments; including principles such as student-centered learning, individualization, and experiential learning. Discussion of practical strategies for setting up and managing a Montessori classroom, including designing the physical environment, managing student behavior, and facilitating student engagement and motivation. Exploration of ways to integrate Montessori curriculum into the classroom, including language arts, mathematics, science, and social studies.

EDUC 3007. OBSERVATION AND ASSESSMENT OF PREADOLESCENTS AND ADOLESCENTS IN MONTESSORI EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: EDUC 3005.

Introduction to the criteria to observe and evaluate the cognitive, social, emotional, and physical development of preadolescents and adolescents within the context of Montessori pedagogy. Study of the underlying theories of pedagogy and its applications, emphasizing the importance of autonomy, creativity, and problem-solving skills.

EDUC 5005. INTRODUCTION TO THE STEAM TEACHING STRATEGY. Three credit hours. Three hours of lecture per week.

Introduction to STEAM education, integrating science, technology, engineering, arts and mathematics in PK-12 education. Emphasis on creative problem solving, identification and creation of necessary materials to teach.

EDUC 5006. LEARNING NEUROLOGY. Three credit hours. Three hours of lecture per week.

Introduction to the neuroscientific foundations of learning. Discussion of cognitive processes that underlie learning and memory, with an emphasis in childhood and adolescence, as well as theoretical and empirical models of neuroplasticity and the effects of aging and neurological impairments on learning.

EDUC 5007. EDUCATIONAL RESEARCH FOR MONTESSORI TEACHERS. Three credit hours. Three hours of seminar per week. Prerequisites: (EDUC 3005 and EDUC 3006 and EDUC 3007 and EDPE 4301) or authorization of the Director of the Department.

Discussion of research methods specifically related to Montessori education, including observations, case studies, and action research using hands-on activities and collaborative projects.

TEED/EDPE/EDUC 3077. INTEGRATION OF TECHNOLOGY IN EDUCATION WITH DISTANCE AND VIRTUAL TEACHING STRATEGIES. Three credit hours. Three hours of lecture per week.

Introduction to the use of current and emerging technologies in the teaching and learning processes. Study of the concepts and theories that best explain the learning process through technological means; the most effective principles of distance education (synchronous, asynchronous and mixed), hybrid teaching and with a combined population.

TEED 5007. CREATING ONLINE COURSES. Three credit hours. Three hours of lecture, discussion and laboratory per week. Prerequisite: EDPE 3129 or authorization of the Director of the Department.

Creation, development and management of an online course taking into account the latest neuroscience findings of how the brain learns. The effect of emotions, course design, organization, aesthetics, communication and evaluation in learning are discussed.

TEED 5008. DESIGN AND CREATION OF EDUCATIONAL MATERIALS FOR ONLINE COURSES. Three credit hours. Three hours of lecture, discussion and laboratory per week. Prerequisite: EDPE 3129.

The steps in designing and creating educational materials for online courses are described and explained. The ideal characteristics, from a pedagogical point of view, are described for each of these materials and their effect on learning, according to empirical evidence. Tools and applications available to facilitate the creation of these digital materials are presented and discussed. Various of these digital materials (e.g. podcasts, infographs, voice-overs, videos, screencasts) will be planned and created as practice.

TEED 5015. ADVANCED STRATEGIES FOR ONLINE COURSES. Three credit hours. Three hours of lecture, discussion, and laboratory per week. Prerequisites: TEED 5007- Creating Online Courses or authorization of the Director of the Department.

Analysis and application of advanced strategies to facilitate online teaching and learning.

TEED 5016. LEARNING MANAGEMENT SYSTEM ONLINE COURSES PRACTICUM. Three credit hours. Three hours of lecture, discussion, and laboratory per week. Prerequisites: EDPE 3129- The Use of Microcomputers in the Classroom or authorization of the Director of the Department.

In this course students will create the elements of an online course within a Learning Management System (LMS). They will add lessons with educational content in various formats, learning activities as well as assessment and evaluation activities using various tools available from the LMS.

TEED 5017. DISTANCE EDUCATION TRENDS. Three credit hours. Three hours of lecture, discussion and laboratory per week.

Discussion of the most used trends in distance education by postsecondary institutions and other public and private educational institutions. Discussion includes distance educational models, combined between distance and face-to-face, as well as synchronous, asynchronous and combined, as well as the implications of these modalities for students, courses and academic programs and strategies for compliance with federal regulations such as student identification, among others.

OFFICE OF THE DEAN OF STUDENTS

DEPARTMENT OF COUNSELING AND PSYCHOLOGICAL SERVICES

UNIV 3005. INTRODUCTION TO THE UNIVERSITY WAY OF LIFE. Zero credit hour. One hour of lecture per week.

Course directed towards a better understanding of the fundamental aspects that affect student life and adequate adjustments to the campus environment. Designed to enhance the academic and social integration in order to help students during their college years. Includes topics such as: study and communication skills, career planning, personal development, computer literacy, academic regulations and institutional resources.

STUDENT EXCHANGE PROGRAMS AND INTERNATIONAL STUDENT SERVICES

UNIV 4000. EXCHANGE PROGRAM. Three to eighteen credit hours.

UPRM students participating in the Exchange Program must register in this course as a placeholder for administration purposes.

COLLEGE OF AGRICULTURAL SCIENCES

CIAG 3025. LIBRARY RESOURCES IN AGRICULTURAL SCIENCES. One credit hour. One hour of lecture per week.

Discussion of available library resources in agricultural sciences, their use, how to discriminate between different sources of information and how to utilize the information for writing papers and preparing oral presentations. Study and discussion of research publications in agricultural sciences.

CIAG 4995. AGRICULTURAL SCIENCES INTERNSHIP One to six credit hours. Prerequisite: authorization of the Director of the Department.

Work experience in Agricultural Sciences supervised and evaluated by a faculty member in coordination with a government agency, academic or research institution, private enterprise or foundation, based on the student's academic background and work requirements.

CIAG 4999. UNDERGRADUATE RESEARCH. One to three credit hours. Three hours of research per week per credit. Prerequisite: authorization of the Director of the Department.

Exposition to research careers in agricultural sciences. Use of the scientific method in the completion of a research project in the student's area of study under the guidance of a faculty member of the College of Agricultural Sciences. Experience in the creation of a research project from its conception to the presentation of its work in several scientific forums. Oral and written presentations at the end of the course. Presentation of a scientific poster.

CITA 3015. INTRODUCTION TO FOOD SCIENCE. Three credit hours. Three hours of lecture per week.

Introduction to composition concepts and the functionality of the major food components. It will show the physical and chemical properties of food, processing methods as well as basic concepts in microbiology, food handling and safety, and sensory analysis.

CITA 4055. SEMINAR. One credit hour. One hour of seminar per week. Prerequisites: CITA 4997-Food Science Practicum or CITA 4999-Undergraduate Research or authorization of the Director of the Department.

Discussion of problems, experiences, research, and recent findings in food science and technology.

CITA 4305. NUTRITION AND FOOD TECNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or (QUIM 3132 and QUIM 3134) or QUIM 3042) and (BIOL 3022 or (BIOL 3062 and BIOL 3064) or BIOL 4015 or CIBI 3002 or BIOL 3435).

Study of the basic concepts of nutrition, nutritional components of food and the function of the nutrients in the human body. Analysis of the effect of technology in the nutritional value of food. Introduction of the role of biotechnology in the production, selection new product development and food consumption.

CITA 4995. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP PLAN STUDENTS. Three to six credit hours. Thirty hours of supervised practice per week. Prerequisite: authorization of the Director of the Department.

Practicum in Food Science and Technology in cooperation with the private sector or government jointly supervised by the academic program, the coop program coordinator, and an official from the cooperating entity.

CITA 4997. FOOD SCIENCE PRACTICUM. Three credit hours. Thirty hours of supervised practice per week. Prerrequisite: Minimum of 12 credits in applicable courses of the curricular sequence or authorization of the Program Coordinator.

Practical professional experience in food science and technology. Student supervision carried out in collaboration between the program and the public or private entity hosting the student.

CITA 4999. UNDERGRADUATE RESEARCH. One to three credit hours. One to three hours of research per week. Prerequisite: authorization of the Director of the Department.

Use of the scientific method for the completion of a research project in the student's area of study under the guidance of a faculty member of the Food Science and Technology Program.

Advanced Undergraduate Courses

CITA 5005. QUALITY CONTROL IN THE FOOD INDUSTRY. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3172 or authorization of the Director of the Department.

Study of quality control tools and the processes of continuous improvement applied to the food industry.

CITA 5006. QUALITY AND SAFETY MANAGEMENT IN FOOD PROCESSING. Three credit hours. Two hours of lecture and three hours of laboratory per week.

Safety and quality principles of the management of a food processing plant in Puerto Rico.

CITA 5007. FOOD INDUSTRY LAWS AND REGULATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Identify key topics and core concepts so that food scientists recognize the laws and regulations that govern the production and handling of foods in the United States and around the world.

CITA 5010. CULINOLOGY. Three credit hours. Two hours of lecture and four hours of laboratory per week. Prerequisites: CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064) or BIOL 4015 or QUIM 3335 or QUIM 5071.

Study of science concepts underlying physical and chemical transformations when cooking or processing food. Comparison of cooking methods, functional ingredients and processing conditions affecting flavor, aroma, and texture properties. Food preparation principles with emphasis on requirements, challenges and trends informulation and food product development.

CITA 5995. SPECIAL PROBLEMS IN FOOD SCIENCE AND TECHNOLOGY. One to three credit hours. One hour of lecture per week per credit.

Study and research of a specific problem in the area of Food Science and Technology selected by the student and the professor.

CITA 5996. SPECIAL PROBLEMS IN FOOD SCIENCE AND TECHNOLOGY II. One to three credit hours. One hour of lecture per week per credit.

Study and research of a specific problem in the area of Food Science and Technology selected by the student and the professor.

CITA 5997. SELECTED TOPICS IN FOOD SCIENCE AND TECHNOLOGY I. One to three credit hours. One to three hours of lecture per week.

Selected topics in food science and technology and related areas.

CITA 5998. SELECTED TOPICS IN FOOD SCIENCE AND TECHNOLOGY II. One to three credit hours. One to three hours of lecture per week.

Selected topics in food science and technology and related areas.

GENERAL PROGRAM IN AGRICULTURAL SCIENCES
(Interdepartmental Program)

Undergraduate Courses

CIAG 4995. AGRICULTURAL SCIENCES INTERNSHIP. One to six credit hours. Prerequisite: authorization of the Director of the Department.

Work experience in Agricultural Sciences supervised and evaluated by a faculty member in coordination with a government agency, academic or research institution, private enterprise or foundation, based on the student's academic background and work requirements.

DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Undergraduate Courses

ECAG 3005. PRINCIPLES OF AGRICULTURAL ECONOMIC ANALYSIS. Three credit hours. Three hours of lecture per week.

Introduction to the field of agricultural economics, with emphasis on the aspects of production. Includes study of the use of economic principles in agricultural production and of supply and demand, and elementary notions of policy making.

ECAG 3007. INTRODUCTION TO THE USE OF COMPUTERS IN THE AGRICULTURAL SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Introduction to computer use, basic concepts of word processor, spreadsheet, and presentation software. Student will use these tools to: create, manage and summarize data bases, create graphs, and write scientific reports with applications to agricultural sciences and agribusiness.

ECAG 3015. AGRICULTURAL LAW. Three credit hours. Three hours of lecture per week.

Analysis of different aspects of law relevant in the agribusiness decision-making process.

ECAG 4005. AGRICULTURAL ECONOMICS PRACTICUM. Three credit hours. A minimum of thirty hours per week during six consecutive weeks. Prerequisite: A minimum of twelve credits in Agricultural Economics and authorization of the Director of the Department.

Practical work experience in Agricultural Economics or Agribusiness. It will be under the supervision of the Department in collaboration with public or private entities.

ECAG 4006. INTRODUCTION TO CONSUMER ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

An examination of topics that illustrate the ways in which consumers make decisions. Emphasis is given to the use of economic principles with respect to use of credit, and the purchase of food, housing, medical plans, education, automobiles, insurance, recreation, and other consumption items.

ECAG 4007. MARKETING OF AGRICULTURAL PRODUCTS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

A general comprehensive study of agricultural products marketing institutions, functions and problems, with emphasis on the Puerto Rican situation. Includes study of supply and demand, market structures, prices, and marketing costs at the various levels of the distribution process.

ECAG 4009. COOPERATIVE ENTERPRISES. Three credit hours. Three hours of lecture per week.

Study of economic and social principles of cooperativism and their implication for development. Discussion of the functioning of different types of cooperatives, including legal aspects.

ECAG 4015. INTRODUCTION TO RESOURCE ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

Introduction to the application of economic and political science concepts to problems in the use of natural resources including water, land, forest, and marine resources. Emphasis is given to concepts of regional growth, to the impact of urban development, and the process of public decision-making in the area of natural resources.

ECAG 4017. SPECIAL PROBLEMS IN AGRICULTURAL ECONOMICS. One to three credit hours. One to three work periods per week. Prerequisite: authorization of the Director of the Department.

Problems in any of the various phases of agricultural economics will be assigned or may be selected, subject to the approval of the professor in charge.

ECAG 4019. FARM MANAGEMENT AND ACCOUNTING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ECON 3021 or ECAG 3005.

Use of economic principles and farm records in the organization and management of a farm business. Includes methods of keeping and analyzing farm records, farm inventory, income and net worth statements, receipts and expenses records, production records, income tax returns; use of economic principles and of records in budgeting; and analysis of aspects of the problems of risk and uncertainty in agriculture. Emphasis is placed on decision-making.

ECAG 4025. SEMINAR. One credit hour. One meeting per week. Prerequisites: authorization of the Director of the Department and twelve credits in Agricultural Economics.

Reports and discussions of problems, observation and recent research. Written and oral reports are required.

ECAG 4026. INTRODUCTION TO RURAL SOCIOLOGY. Three credit hours. Three hours of lecture per week.

Scientific study of rural society, its population, structure and social processes. Emphasis is given to the rural area of Puerto Rico.

ECAG 4027. PRINCIPLES OF COMMUNITY ORGANIZATION. Three credit hours. Three hours of lecture per week.

Study of the community structure and the processes relevant to its social and economic developments.

ECAG 4028. AGRICULTURAL FINANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

Study of the methods and problems in financing the farm business, with emphasis on the aspects of credit. Includes study and analysis of credit requirements, institutions, types and effects.

ECAG 4029. AGRIBUSINESS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 or ECAG 3005.

Managerial concepts. Application of economic principles. Analytical techniques and decision making procedures in agribusiness. Planning, organization, financial analysis and control, human relations. Case studies, discussion, and work problems involving actual managerial situations.

ECAG 4035. FARM APPRAISAL. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

Application of the process of farm appraisal based on economic, environmental, and market conditions. Study of appraisal concepts relevant to the preparation of a farm value report.

ECAG 4991. AGRICULTURAL ECONOMIC INTERNSHIP. One to six credit hours. Prerequisite: authorization of the Director of the Department.

Work experience in Agricultural Economics supervised and evaluated by a departmental member in coordination with a government agency, academic or research institution, private enterprise or foundation, in accordance with the student's academic background and work requirements.

ECAG 4993. SELECTED TOPICS I. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in Agricultural Economics, Agribusiness, Rural Sociology and other related areas.

ECAG 4994. SELECTED TOPICS II. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in Agricultural Economics, Agribusiness, Rural Sociology and other related areas of interest.

ECAG 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisites: authorization of the Director of the Department and to be a Coop program student.

Practical experience in agricultural economics and agribusiness management in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator, and an official from the cooperating entity. A written report will be required upon completion of each work period.

Advanced Undergraduate and Graduate Courses

ECAG 5006. FEASIBILITY STUDIES OF AGRICULTURAL ENTERPRISES. Three credit hours. Three hours of lecture per week. Prerequisites: ECAG 4019 or authorization of the Director of the Department.

Use and application of feasibility studies for the establishment and development of agricultural enterprises, considering sustainability of the resources.

DEPARTMENT OF AGRICULTURAL EDUCATION

Undergraduate Courses

EDAG 3005. AGRICULTURAL ORIENTATION. One credit hour. One hour of lecture per week.

A survey of the general goals, functions and policies of the main agricultural organizations working in Puerto Rico, emphasizing the objectives of the College of Agricultural Sciences, thus guiding the student in the selection of courses and field of specialization.

EDAG 3006. INTRODUCTORY INTERNATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 3005.

Study and discussion of world agriculture and food production issues including factors such as: geographical characteristics, cultural issues, and political, social and economic problems. Special attention is given to agricultural production in developing countries and the tropics.

EDAG 4005. METHODS IN TEACHING VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: junior standing.

This course is intended to help students develop a sound philosophy of all-day instruction in vocational agriculture. It emphasizes the preparation of annual teaching calendars, job analyzing, the learning process, methods and techniques of teaching, lesson planning and the evaluation of learning.

EDAG 4006. CURRICULUM DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Curriculum planning theory and practices. Problems and principles in curriculum development. Defining goals and objectives. Selecting appropriate curriculum designs, and planning curriculum implementation and evaluation.

EDAG 4007. ORGANIZATION AND ADMINISTRATION IN VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

The Vocational Education Act: general rules and regulations for the administration and functioning of Vocational Agriculture Department, and the qualification and duties of the teachers of vocational agriculture.

EDAG 4008. SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles, practices and procedures to planning, programming, implementing and evaluating comprehensive supervised farming programs and supervised occupational experience programs. Emphasis will be given to purpose of farm and off farm occupational experience programs. Analysis of home farm and off farms employment experience opportunities and program planning and supervision.

EDAG 4009. TEACHING YOUNG AND ADULT FARMERS. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles and practice of planning, organizing, promoting, implementing and evaluating young adult farmer courses. Emphasis will be given to the decision-making approach, selection of methods and techniques, lesson planning, class management and evaluation techniques.

EDAG 4015. YOUTH ORGANIZATION AND PROGRAMS. Three credit hours. Three hours of lecture per week.

History, philosophy, importance, objectives, and work programs of youth organization. Advisors, function, and characteristics, planning programming, implementation, and evaluation of the organization work program, with emphasis in F.F.A., 4-H, and young farmers.

EDAG 4016. AUDIOVISUAL MEDIA IN TEACHING VOCATIONAL AGRICULTURE. Three credit hours. Two hours of lecture and three hours of laboratory per week.

Philosophical and psychological implication of the use of audiovisual media in teaching. Location, selection, and evaluation of the audiovisual material for teaching purposes. Planning, designing and preparation of audiovisual material to teach vocational agriculture. Practice in the operation and management of audiovisual equipment and a media center.

EDAG 4017. SEMINAR. One credit hour. One hour of lecture per week. Prerequisite: nine credits in agricultural education or agricultural extension.

Discussion of problems related to the development of instructional programs in vocational agriculture; planning, organization, development, follow-up, evaluation, related legislation and trends.

EDAG 4018. TEACHING PRACTICE I. Three credit hours per semester. One hour of lecture and six hours of laboratory work per week, each semester. Prerequisite: EDAG 4005, EDAG 4006. Corequisite: EDAG 4007.

Supervised observation of vocational agriculture teaching. Full time participatory experience of trainees in all phases of the work of vocational agriculture teachers.

EDAG 4019. TEACHING PRACTICE II. Three credit hours per semester. One hour of lecture and six hours of laboratory work per week, each semester. Prerequisite: EDAG 4018.

Supervised observation of vocational agriculture teaching. Full time participatory experience of trainees in all phases of the work of vocational agriculture teachers.

EDAG 4025. EVALUATION OF STUDENTS IN VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles, criteria, procedures and techniques employed in the evaluation of the performance of students in Vocational Agriculture.

EDAG 4026. SUPERVISION IN AGRICULTURAL EXTENSION AND VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week.

Theories, principles and practice pertaining to supervision in agricultural extension and vocational agriculture; factors that influence needs, philosophies, and types of supervision at the local, regional, state and national levels; training, responsibilities, personal traits and duties of the supervisor.

EDAG 4030. STUDY TOUR IN AGRICULTURE AND NATURAL RESOURCES. Three credit hours. Twelve to fifteen hours of orientation meetings and a trip during the summer session. Prerequisite: have completed a minimum of 48 credits of its program of study in the Agricultural Sciences Faculty.

Study tour to foreign countries with the purpose of observing and studying the agricultural industry and the management and conservation of natural resources. The opportunity to become familiarized with governmental agencies, universities, agricultural experimental stations, and natural resources will be provided. Activities to incorporate the cultural aspects of the visited country will be included.

AGRICULTURAL EXTENSION

Undergraduate Courses

EXAG 4005. EXTENSION PHILOSOPHY AND OBJECTIVES. Three credit hours. Three hours of lecture per week.

This course is designed to familiarize students with the organization, philosophy, and objectives of the Agricultural Extension Service.

EXAG 4006. TEACHING METHODS AND TECHNIQUES IN EXTENSION. Three credit hours. Three hours of lecture per week.

This course covers the various educational methods used by the Extension Service. The students will participate in the major activities of the extension work in the district in cooperation with the local agent of the Puerto Rico Agricultural Extension Service.

EXAG 4007. AGRICULTURAL EXTENSION PRACTICUM. Three credit hour. Thirty hours of practice per week. Prerequisites: (CIAN 3011 and CIAN 3012) and CIAN 4005 and CFIT 3005 and (AGRO 3011 and AGRO 3013) and EDAG 3005 and HORT 3005 and PROC 4006 and EXAG 4005 and CFIT 4005 and EXAG 4006 and AGRO 4037 and EDAG 4015 and authorization of the Director of the Department.

Practical work experience in agricultural extension. It is carried out under the supervision of the department in collaboration with public and private entities.

EXAG 4008. SPECIAL PROBLEMS IN EXTENSION. One to three credit hours. One to three research periods per week. Prerequisite: EXAG 4005.

The student selects and studies an area of extension of his interest, and reports the findings.

EXAG 4009. SEMINAR IN EXTENSION EDUCATION. One credit hour. One hour of lecture per week. Prerequisite: EXAG 4005.

Discussions of problems related to Program Planning Development, Rural Development, Farm Home Development, or other phases of Extension work. Areas to be discussed are selected at the beginning of the course.

EXAG 4015. INTRODUCTION TO AGRICULTURAL COMMUNICATION. Three credit hours. Three hours of lecture per week.

Principles and practices in communications; skills and knowledge for person to person, group, and mass communication; panel and group discussions. Practical exercises.

EXAG 4016. GROUP DYNAMICS AND LEADERSHIP. Three credit hours. Three hours of lecture per week.

Discussion of the research and theory in the study of small groups with emphasis on motivational forces involved, and the leadership function in the attainment of the group goals.

DEPARTMENT OF AGRICULTURAL AND BIOSYSTEMS ENGINEERING

Undergraduate Courses

INAG 4418. COMPUTER AIDED DESIGN IN AGRICULTURE. Two credit hours. One hour of lecture and three hours of laboratory per week. Prerequisite: INGE 3011.

Introduction to computer aided design for agricultural structures, irrigation systems, machinery elements and other agricultural applications.

INAG 4990. SELECTED TOPICS IN AGRICULTURAL ENGINEERING. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in mechanical power and agricultural machinery, soil and water management, agricultural structures and environmental control, farm electrification, irrigation and drainage, agricultural products processing or other areas related to agricultural engineering.

INAG 4996. AGRICULTURAL ENGINEERING PROJECTS. Two to four credit hours.

Supervised projects in areas of agricultural engineering. A written report is required.

SAGA 3016. COMPUTING AND COMMUNICATION IN AGRICULTURAL AND ENVIRONMENTAL SYSTEMS. Three credit hours. Three hours of lecture per week.

Use of digital and computational resources for the elaboration of academic manuscripts, management and descriptive data analysis, creation of charts and presentations to study and address problems related to agricultural and environmental systems. Transversal skills will be developed to promote critical thinking and effective communication.

SAGA 4005. FARM ELECTRIFICATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3172, or FISI 3152, or FISI 3091.

Application of electrical energy to agricultural production and rural living. Fundamentals of selection, installation, operation, and maintenance of electrical farm equipment; safety rules and regulations.

SAGA 4007. METALWORKING AND WELDING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3172 or FISI 3152 or FISI 3091.

Agricultural mechanics shop skills, with emphasis on metal work, oxyacetylene cutting and welding, electric arc welding, safety and organization of the farm shop.

SAGA 4008. AGRICULTURAL AND ENVIRONMENTAL SYSTEMS PRACTICUM. Three credit hours. Thirty hours per week for six consecutive weeks. Prerequisites: a minimum of nine credits approved in Agricultural and Environmental Systems required courses at 4000 level and authorization of the Director of the Department.

Practical professional experience in Agricultural and Environmental Systems. It is carried out under the supervision of the department in collaboration with public or private entities.

SAGA 4009. MECHANICAL POWER IN AGRICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171 or FISI 3151, or FISI 3091.

Sources, measurement, transmission, and economic application of mechanical power on the farm. Principles of construction and operation of various types of farm power units, with particular emphasis on internal combustion engines. Classification, selection, operation, and maintenance of agricultural farm power units.

SAGA 4010. AGRICULTURAL AND ENVIRONMENTAL SYSTEMS INTERNSHIP. One to six credit hours. Four hours of internship per week per credit during 15 consecutive weeks. Prerequisite: authorization of the Director of the Department.

Work experience in the area of Agricultural and Environmental Systems in a business enterprise or a state or federal government agency, under the supervision of a faculty member in coordination with an immediate supervisor at the internship location.

SAGA 4015. AGRICULTURAL MACHINERY I. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: MATE 3172 or MATE 3005.

Study of the principles of construction, operation and maintenance of agricultural machinery. The course covers safety rules, power requirements, calibration and cost of use of the main agricultural machines.

SAGA 4017. SAFETY IN AGRICULTURE. Two credit hours. Two hours of lecture per week.

Principles of personnel and property protection as applied to agricultural operations and use of agricultural machinery, with emphasis on the development of a philosophy of safety as a basis for effective accident prevention.

SAGA 4019. FARM DRAINAGE AND IRRIGATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013.

Principles of irrigation and drainage of farm lands. Drainage systems, sources of water supply, water quality, irrigation distribution systems through gravity, sprinkler or trickle.

SAGA 4028. AGRICULTURAL STRUCTURES. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: (INGE 3011 or INGE 4005) and (FISI 3171 or FISI 3151 or FISI 3091).

Planning of agricultural structures, functional requirements, construction materials, construction; principles and procedures, with particular reference to main agricultural structures.

SAGA 4029. AGRICULTURAL PRODUCTS PROCESSING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171 or FISI 3091 or FISI 3151.

Unit operations, equipment, techniques, and processes used in handling and preparing of farm products for marketing, utilization, or storage.

SAGA 4035. SOIL AND WATER MANAGEMENT. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013 and INCI 4005.

Soil-water-plant relationships; principles and practice of irrigation and drainage of farm lands; land improvement by means of mechanical procedures, or structures for soil and water management and conservation.

SAGA 4036. SEMINAR IN AGRICULTURAL AND ENVIRONMENTAL SYSTEMS. One credit hour. One hour of seminar per week. Prerequisites: SAGA 4008 or authorization of the Director of the Department.

Reviews, study, and discussion of the latest developments and work experiences in the field of Agricultural and Environmental Systems.

SAGA 4037. SEMINAR IN AGRICULTURAL AND ENVIRONMENTAL SYSTEMS. One credit hour. One hour of seminar per week. Prerequisites: SAGA 4008 or authorization of the Director of the Department.

Discussion of latest developments in the field of Agricultural and Environmental Systems.

SAGA 4038. AGRICULTURAL HYDROLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171 or FISI 3151 or FISI 3091.

The study of the hydrologic cycle, weather elements and climate, water precipitation, evaporation, transpiration, infiltration, soil moisture and run-off as related to soil and water management.

SAGA 4039. AGRICULTURAL WASTE MANAGEMENT. Three credit hours. Two hours of lecture per week and one three-hour laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013.

Study of characteristics and management of agricultural waste. Biological and physicochemical treatments. Environmental impact and pollution problems. Legal and economic aspects.

SAGA 4041. AGRICULTURAL TRACTORS AND MACHINERY. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: FISI 3091 or FISI 3171 or FISI 3151.

Analysis of the principal components, operation and maintenance of tractors and agricultural machinery. Safety rules, power requirements, calibration and cost use of the tractors and the main agricultural machines will be evaluated.

SAGA 4048. FARM BUILDINGS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3011 and (MATE 3172 or MATE 3005).

Discussion of construction planning principles and procedures, functional requirements, and the selection of construction materials in main agricultural structures.

SAGA 4105. FERMENTATION BIOTECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3172 and QUIM 3132 and QUIM 3134.

Use of microorganisms in diverse agricultural, industrial, and environmental applications. Topics include the use of silage for livestock feed production, manufacturing of alcoholic beverages, fermentations in the food industry, the production of antibiotics, wastewater treatment and bioremediation. Field trips required.

SAGA 4129. AGRICULTURAL PRODUCTS PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3091 or FISI 3151 or FISI 3171.

Unit operations, equipment, techniques and processes used in handling and preparation of farm products for marketing, utilization and storage.

SAGA 4216. AGRICULTURAL MACHINERY II. Three credit hours. Three hours of lecture per week. Prerequisites: SAGA 4015 or SAGA 4041.

Performance evaluation, selection criteria and cost analysis of agricultural machinery with emphasis in hay, silage, and specialty crops; application of emerging technologies to farm machinery.

SAGA 4226. MECHANIZED MILKING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerrequisitos: MATE 3172 and (CIAN 3011 and CIAN 3012).

Analysis of milking parlors and equipment. Discussion and application of standards and guidelines for the selection of components, cleaning and higiene, and the evaluation of the milking system performance. Field trips are required.

SAGA 4245. HYDRAULIC AND PNEUMATIC SYSTEMS IN AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3172.

Analysis of the hydraulic and pneumatic systems used in agricultural machinery and processes.

SAGA 4319. FARM DRAINAGE AND IRRIGATION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013.

Principles of irrigation and drainage of farm lands. Drainage systems, sources of water supply, water quality, irrigation distribution systems through gravity, sprinkler or trickle.

SAGA 4335. SOIL AND WATER MANAGEMENT. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: (AGRO 3011 and AGRO 3013) and INCI 4005.

Soil-water-plant relationships; principles and practice of irrigation and drainage of farm lands; land improvement by means of mechanical procedures, or structures for soil and water management and conservation.

SAGA 4501. RENEWABLE ENERGY IN AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3091 or FISI 3172 or FISI 3052.

Study of renewable energy systems, their main components, operation and applications to agriculture. Determination of electricity demand and strategies for energy conservation. Emphasis will be given to solar thermal, photovoltaic, wind, micro hydroelectric systems, and bioenergy, among others. A renewable energy project is required in an agricultural application.

SAGA 4505. ELECTROTECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3049 or MATE 3031 or MATE 3021.

Fundamentals of the usage of electric materials for the application of electrical energy in agricultural systems and housing. A project is required on the planning and execution of an electrical installation.

SAGA 4990. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR CO-OP STUDENTS. Three to six credit hours.

Practical experience in Agricultural and Environmental Systems in cooperation with the private sector or government. To be jointly supervised by the academic department, the coop program coordinator, and an official from the cooperating entity. Written reports will be required upon completion of each work period.

SAGA 4991. SPECIAL PROBLEMS. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Problems pertaining to the applied and technical aspects of Agricultural Engineering related to the agriculture of Puerto Rico. Conferences, library research, laboratories, of field trips will be assigned on an individual basis.

SAGA 4992. SPECIAL PROBLEMS. One to three credit hours. One to three hours of lecture per week.

Problems pertaining to the applied and technical aspects of Agricultural Engineering related to the agriculture of Puerto Rico. Conferences, library studies, laboratories or field trips will be assigned on an individual basis.

Advanced Undergraduate and Graduate Courses

INAG 5990. SELECTED TOPICS. One to three hours of lecture per week. One to three hours of lecture per week.

Selected topics in Agricultural Engineering. Topics will vary according to the needs and interest of the students and the faculty.

SAGA 5005. EQUIPMENT FOR APPLICATION OF CHEMICAL AND BIOLOGICAL PRODUCTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: (TMAG 4015 or SAGA 4015) or authorization of the Director of the Department.

Study of techniques and equipment used for the application of chemical and biological products in agriculture.

SAGA 5006. MANAGEMENT OF AGRICULTURAL MACHINERY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: (TMAG 4015 or SAGA 4015) or authorization of the Director of the Department.

Study of the principles and practices for managing agricultural machinery. Analysis of the relationship among machinery, implements, agricultural production and economic aspects.

SAGA 5007. ADVANCED SOIL AND WATER MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: (TMAG 4035 or SAGA 4035) or authorization of the Director of the Department.

Soil water and plant relationships. Principles and practice of irrigation and drainage of farm lands. Land improvement by mechanical procedures or structures for soil and water management and conservation.

SAGA 5008. GEOGRAPHIC INFORMATION SYSTEM IN NATURAL RESOURCES MANAGEMENT. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: MATE 3172 or authorization of the Director of the Department.

Study of fundamentals of a geographic information system (GIS) and its applications in agriculture and natural resources management. Development of interfaces with hydrology-hydraulic models, watershed management, soil erosion and sediment transport models, crop simulation models, and precision agriculture models.

SAGA 5016. ANAEROBIC DIGESTION OF AGRICULTURAL WASTE. Three credit hours. Two hours of lecture per week and one period of laboratory of three hours per week. Prerequisites: (QUIM 3131 and QUIM 3133) or authorization of the Director of the Department.

Study of the use of anaerobic digesters for agricultural waste management. Production of methane gas and its conversion to electrical and mechanical energy.

SAGA 5030. PRECISION AGRICULTURE TECHNOLOGIES. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: TMAG 4015 or SAGA 4015 or authorization of the Director of the Department.

Analysis of the foundations of precision technologies in modern agriculture including Global Positioning System (GPS) receivers, Geographical Information Systems (GIS) software, automatic tractor guidance systems, variable rate technologies, and sensing technologies.

SAGA 5125. FOOD PACKAGING. Three credit hours. Three hours of lecture per week.

Study of food packaging and its multiple roles in protecting packaged food and beverage products and facilitating distribution and communication with retailers, consumers and users. Study of the relationship between food packaging and health, safety and economic well being. Use of technology and its integration with products, distribution, and marketing.

SAGA 5126. FOOD SAFETY. Three credit hours. Three hours of lecture per week.

Practices and methods to guarantee food safety and product integrity. Topics such as laws and regulations, good manufacturing practices (gmp's), hazard analysis and critical control points (haccp), and food labeling will be discussed.

SAGA 5315. MICRO-IRRIGATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: (AGRO 3011 and AGRO 3013) or authorization of the Director of the Department.

Study of the micro-irrigation systems and its components, soil-water-plant relationships, crop water requirements, troubleshooting and field evaluation.

SAGA 5317. AGROCLIMATOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Study and application of the climatology and meteorology related to agriculture with emphasis on the caribbean region.

SAGA 5991. SELECTED TOPICS. One to three credit hours. One to three hours of lecture per week.

Selected topics in Agricultural Engineering. Topics will vary according to the needs and interests of the students and the faculty.

SAGA 5995. PROBLEMS IN MECHANIZED AGRICULTURE. One to three credit hours. One to three research periods per week.

Problems pertaining to the applied and less technical aspects of Agricultural Engineering as related to the agriculture of Puerto Rico. Conferences, library laboratory and/or field work on an assigned problem, on an individual basis, with complete written report required.

DEPARTMENT OF AGROENVIRONMENTAL SCIENCES

PROGRAMS OF AGRONOMY AND SOILS

Undergraduate Courses

AGRO 3010. INTRODUCTION TO WETLAND ECOSYSTEMS. Three credit hours. Two hours of lecture and a three hour laboratory per week. Prerequisite: QUIM 3002 or (QUIM 3132 and QUIM 3134).

Study of the different types of wetlands with emphasis on the factors that determine their formation and stability. The functions and value of each wetland type and the use of these ecosystems to improve the environment will be discussed.

AGRO 3011. FUNDAMENTALS OF SOIL SCIENCES. Two credit hours. Two hours of lecture per week. Prerequisites: QUIM 3002 or (QUIM 3132 and QUIM 3134). Corequisites: AGRO 3013.

Analysis of the origin, classification and the physical, chemical, and biological properties of soils and their role in crop growth. Tropical soils will be emphasized.

AGRO 3013. SOIL SCIENCES LABORATORY. One credit hour. Three hours of laboratory per week. Corequisites: AGRO 3011.

Laboratory on the origin, classification and physical chemical and biological properties of soils and their role in crop growth.

AGRO 4005. SOIL CONSERVATION. Three credit hours. Two hours of lecture and one three-hour field or laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013.

The use of vegetation, plant barriers, terraces, mechanical structures, crop rotations, and other practices for soil and water conservation, forest and wildlife conservation, conservation problems, adjustments, and programs in Puerto Rico. Field trips.

AGRO 4007. SOIL MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770 or PROC 4016.

Biological soil processes; occurrence and activity of soil microorganisms as applied to soil fertility; their influence on organic matter transformation, and nitrogen economy in soils.

AGRO 4008. TROPICAL CEREALS AND LEGUMES. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

Adaptation, botany, distribution, varieties, culture, crop improvement, harvesting and marketing of corn, rice, cotton and sweet potatoes. Field trips.

AGRO 4010. SILVICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3435 or CFIT 3005 or BIOL 3051 or (BIOL 3061 and BIOL 3063).

Study of the establishment, management and conservation of forest resources with economical, ecological and recreational purposes.

AGRO 4015-4016. SPECIAL PROBLEMS. One to three credit hours. One to three research periods per week. Prerequisite: authorization of the Director of the Department.

Problems in the production, improvement and genetics of crop plants will be assigned, or may be selected, subject to the approval of the professor in charge.

AGRO 4018. PHYSICAL AND CHEMICAL PROPERTIES OF SOILS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013.

An advanced course in the physical and chemical processes of soils, with emphasis on their practical application and significance. Laboratory practice in the use of physical and physicochemical techniques used in soil investigations.

AGRO 4019. SEMINAR. One credit hour per semester. One hour of lecture per week each semester. Prerequisite: authorization of the Director of the Department.

Reports and discussions of observations and problems in farm practices and recent crop investigations.

AGRO 4025. SEMINAR. One credit hour per semester. One hour of lecture per week each semester. Prerequisite: authorization of the Director of the Department.

Reports and discussions of observations and problems in farm practices and recent crop investigations.

AGRO 4026. CROP ECOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

Study of the environmental conditions which determine the adaptation, distribution and productivity of crops.

AGRO 4029. MANAGEMENT OF TROPICAL SOILS. Three credit hours. Three hours of lecture per week. Prerequisites: AGRO 3011 and AGRO 3013.

Application of the principles of soil science and crop science, in the evaluation of management practices on tropical soils.

AGRO 4035. INTRODUCTION TO CONSERVATION OF NATURAL RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Study of the natural resources of Puerto Rico and the principles involved in their utilization, management and development. Study of the effect of demand and activities of people on the natural resources and related to the conservation of natural resources and the quality of environment will be discussed. Field trips and a written report are required.

AGRO 4037. SOIL FERTILITY AND FERTILIZERS. Three credit hours. Three hours of lecture per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

Fundamental principles underlying the maintenance of soil productivity; sources, manufacture, and utilization of fertilizer materials and mixed fertilizers, and their effect on the plant and on the soil.

AGRO 4038. AGRONOMY AND SOILS PRACTICUM. Three credit hours. A minimum of thirty hours per week during six consecutive weeks. Prerequisite: a minimum of twelve credits in Agronomy and Soils and authorization of the Director of the Department.

Practical work experience in crops and soils. It will be conducted under the supervision of the Department in collaboration with public and private entities.

AGRO 4045. MINERAL NUTRITION IN PLANTS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: AGRO 3011 and AGRO 3013 and CFIT 4005.

The basic processes and principles of mineral nutrition of higher plants will be covered. Special emphasis will be given to the factors that affects absorption and translocation as well as the function of essential elements in higher plants.

AGRO 4046. AGROSTOLOGY AND FORAGE AND PASTURE MANAGEMENT. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

A fundamental study of grasses, specially those of economic importance in the Caribbean area: the main characteristics of various genera and species of grasses, their identification, distribution, propagation, and economic uses. Will also include knowledge on the adaptation, management, and nutritive value of cultivated and native pasture plants, with special emphasis on the establishment, management, and improvement of temporary and permanent pasture. Required field trips.

AGRO 4057. SOIL, PLANT, AND WATER CHEMICAL ANALYSIS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisites: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

Study of the basic concepts of theory and practice in instrumental analytical chemistry applied to the analysis of soil, plant, and water. Practice in the process of collecting and preparing samples, as well as principles of the operation of instruments. Emphasis to the analysis related to problems in soil, plant, and environmental sciences.

AGRO/HORT 4066. TURFGRASS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

Study of the physiology, management, and characteristics of tropical and subtropical turfgrasses. Establishment, fertilization, irrigation, mowing, and pest and disease control practices will be emphasized.

AGRO 4990. SELECTED TOPICS IN AGRONOMY AND SOILS. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in soils, pastures, genetic improvement of agronomic crops, biotechnology, sustainable agriculture, and related areas.

AGRO 4995. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisite: authorization of the Director of the Department and to be a Coop program student.

Practical experience in agronomy or soil sciences in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator, and an official from the cooperating entity. Written reports will be required upon completion of each work period.

Advanced Undergraduate and Graduate Courses

AGRO 5005. BIOMETRICS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: authorization of the Director of the Department.

Basic concepts of statistical reasoning applied to problems in agricultural, biological and environmental sciences. Data gathering, graphical description and numerical summarization. Concepts of probability and sampling. Estimation and hypothesis testing, analysis of variance, linear regression and correlation. Students describe and analyze real data sets and use statistical computing programs.

AGRO 5006. GENESIS, MORPHOLOGY AND CLASSIFICATION OF SOILS. Three credit hours. Three hours of lecture per week. Prerequisites: (AGRO 3011 and AGRO 3013) or authorization of the Director of the Department.

Historical development of concepts of soil and systems of soil classification; principles and nomenclature of "Soil Taxonomy"; environmental factors and processes of soil formation; and field study of soil profiles. Field trips are required.

AGRO 5007. SOIL PHYSICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Physical properties of soils, and factors affecting them; soil consistency, structure, water, air, temperature, tillage; evaluation and influence in determination of soil productivity.

AGRO 5008. SOILS OF PUERTO RICO. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: AGRO 5006 or authorization of the Director of the Department.

Study of the genesis and distribution of the soils of Puerto Rico, based on environmental conditions; classification of soils using the "Soil Taxonomy" system; evaluation of the morphological, chemical, physical, and mineralogical properties of soils with respect to agricultural and not agricultural uses. Representative soil profiles are studied during field trips.

AGRO 5010. MANAGEMENT OF NATURAL FORESTS. Three credit hours. Two hours of lecture and one three hour laboratory per week. Prerequisites: BIOL 3435 or CFIT 3005 or BIOL 3051 or (BIOL 3061 and BIOL 3063) or authorization of the Director of the Department.

Study of the composition and structure of the different forest systems of the tropics, such as wet forest, deciduous forest, dry forest, conifer forest and mangrove from the stand point of their multiple use and sustainability. Field trips required.

AGRO 5015. CONSERVATION, MANAGEMENT AND DEVELOPMENT OF NATURAL RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 4035 or authorization of the Director of the Department.

Study of concepts, methods and techniques in the conservation, management and development of natural resources, and their effects on environmental quality. Contemporary issues and problems in the management and allocation of natural resources will be discussed.

AGRO 5501. AGRICULTURAL BIOTECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3062 and (BIOL 3015 or BIOL 3300) and (BIOL 3770 or PROC 4016) or authorization of the Director of the Department.

Biological concepts for biotechnology: enzymes, nucleic acids, genetic transfer mechanisms, operons, plasmids, vectors, cloning, DNA sequencing, monoclonal antibodies, clonal production and hybridization.

AGRO 5502. AGRICULTURAL BIOTECHNOLOGY LABORATORY. One credit hour. One three-hour laboratory per week. Corequisite: AGRO 5501.

Experiments or demonstrations on microbial growth, DNA isolation, embryo transfer, protoplast isolation, tissue culture, plant hybridization, mutagenesis plasmid isolation and DNA electrophoresis. Restriction enzymes and other DNA techniques.

CFIT 3005. FUNDAMENTALS OF CROP PRODUCTION. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Fundamental principles of the growth and propagation of agronomic and horticultural plants; the relation of environment to the distribution, adaptation and utilization of crops; fundamentals of soil management, tillage, rotation, plant improvement, pest control, and other practices related to the production and management of crops.

CFIT 4005. PHYSIOLOGICAL PRINCIPLES OF CROP PRODUCTION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: ((BIOL 3051 or (BIOL 3061 and BIOL 3063) or BIOL 3435) and (QUIM 3132 and QUIM 3134) or QUIM 3002).

Principles of the vital processes of crops; growth differentiation and development. Mineral nutrition, plant-water relationship, photosynthesis, respiration, photoperiodism and plant hormones.

CFIT 4007. PLANT BREEDING. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3015 or BIOL 3300.

The improvement of crop plants by hybridization, selection and induced mutations; methods and techniques applicable to sexually and asexually reproduced plants.

CFIT 5006. PHYTOREMEDIATION. Three credit hours. Three hours of lecture per week. Prerequisites: ((BIOL 3435 or BIOL 3051 or (BIOL 3061 and BIOL 3063)) and (QUIM 3002 or (QUIM 3132 and QUIM 3134))) or authorization of the Director of the Department.

Discussion of the relevant concepts used in phytoremediation. Study of the principles used in phytoremediation such as the use of vascular plants for the phytoextraction, rhyzofiltration, phytostabilization and phytovolatilization of organic and inorganic contaminants from the soils and water resources.

CROP PROTECTION

Undergraduate Courses

PROC 4006. TROPICAL PHYTOPATHOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 3435 or BIOL 3417 or BIOL 3051 or (BIOL 3061 and BIOL 3063).

Study of diseases of main tropical plants including the host range, symptoms and signs, etiology, cycles, epiphytology, distribution, economic importance, and control.

PROC 4008. AGRICULTURAL ENTOMOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 4015 or BIOL 3052 or (BIOL 3062 and BIOL 3064).

Entomological study from the agricultural standpoint, including insect taxonomy, economic importance, and control. Methods of collection, mounting and preservation of insects will also be emphasized. A collection of insects of economic importance in agriculture is required.

PROC 4016. AGRICULTURAL BACTERIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and QUIM 3002 or (CFIT 3005 and QUIM 3132 and QUIM 3134).

The study of the chemical, physical and biological characteristics of bacteria, associated with agricultural crops, with emphasis on the basic techniques employed for isolation, culturing, identification and control.

PROC 4017. WEED CONTROL. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and QUIM 3002 or (CFIT 3005 and QUIM 3132 and QUIM 3134).

Classification and identification of weeds of economic importance, discussion of physiological principles related to weed control, and eradication, commercial herbicides usage and other control methods.

PROC 4018. INTRODUCTION TO AGRONEMATOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 4015 or BIOL 3052 or (BIOL 3062 and BIOL 3064).

History, morphology, classification and life cycles of nematodes, especially the plan parasites; laboratory methods for soil and plant tissue separation of nematodes, and identification.

PROC 4019. PESTICIDES AND THEIR USE IN AGRICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3061.

Studies of pesticides including their chemical composition, their effects as environmental contaminants, their mode of action, toxicity and determination of their residues. Orientation will be given on management and disposal, methods of protecting personnel and pertinent federal and state legislation regarding pesticides usage.

PROC 4025. CROP PROTECTION PRACTICUM. Three credit hours. A minimum of thirty hours per week during six consecutive weeks. Prerequisite: A minimum of twelve credits in Crop Protection and authorization of the Director of the Department.

Practical work experience in Crop Protection. It is carried out under the supervision of the Department in collaboration with public and private entities.

PROC 4026. SEMINAR. One credit hour. One-hour meeting per week.

Review and discussion of the recent literature in crop protection.

PROC 4030. INTRODUCTION TO INTEGRATED PEST MANAGEMENT. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisites: PROC 4008 and PROC 4006.

Study of the principles of integrated pest management as it applies to insects, pathogens, weeds, and other minor pests of phytosanitary importance. Methods of prevention, eradication, control and containment of invasive pests will be discussed.

PROC 4035. PLANT BIOSECURITY SEMINAR. One credit hour. One hour of seminar per week. Prerequisites: PROC 4008 and PROC 4006 and PROC 4017.

Discussion of topics in plant biosecurity, including review of scientific articles and presentations by invited speakers. An oral presentation and a written report are required.

PROC 4993. SELECTED TOPICS I. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in crop protection. Topics will vary according to the needs and interests of the students and the faculty.

PROC. 4994. SELECTED TOPICS II. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in crop protection. Topics will vary according to the needs and interests of the students and the faculty.

PROC 4995. SPECIAL PROBLEMS. One to three credit hours per semester. One to three study and research periods per week. Prerequisite: authorization of the Director of the Department.

Study and investigation of a specific problem in the field of crop protection.

PROC 4996. SPECIAL PROBLEMS. One to three credit hours per semester. One to three study and research periods per week. Prerequisite: authorization of the Director of the Department.

Study and investigation of a specific problem in the field of crop protection.

PROC 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisites: authorization of the Director of the Department and to be a Coop Program student.

Practical experience in Crop Protection in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator, and an official from the cooperating entity. A written report will be required upon completion of each work period.

Advanced Undergraduate and Graduate Courses

PROC 5005. PHYTOPATHOGENIC FUNGI. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PROC 4006 or authorization of the Department Director.

Examination of the most interesting groups of fungi from the phytopathogenic point of view: their taxonomy, nomenclature, morphology, genetics, host-parasite relationship, physiology, and ecology. Distinctive characteristic of specific pathogens. Field trips for collection and observation are required.

PROC 5006. INSECTS OF TROPICAL CROPS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PROC 4008 or CFIT 4008 or authorization of the Director of the Department.

Major insects affecting tropical crops; their biology and taxonomy; identification of damages in the field as well as in the laboratory; appropriate measures of control.

HORTICULTURE

Undergraduate Courses

HORT 3005. PLANT PROPAGATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Principles and practices followed in the propagation of plants. A study of seeds, cuttings, grafting, budding, transplanting and modified organs used in the propagation of plants. Green houses, propagators, seedbeds and other structures will be discussed.

HORT 3015. COMMERCIAL PRODUCTION OF HERBACEOUS ORNAMENTALS. Three credit hours per semester. Three hours of lecture per week. Prerequisite: CFIT 3005.

Theory and practice of the commercial production of herbaceous ornamental plants with potential for Puerto Rico and their landscape use.

HORT 3025. ORCHIDOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005 or BIOL 3435 or BIOL 3052 or (BIOL 3062 and BIOL 3064).

Study of the biology, commercial production, marketing, and utilization of orchids as ornamental plants.

HORT 4005. ORNAMENTAL HORTICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Theory and practice of the major fields of ornamental horticulture: floriculture, nursery production, turf grass management, and landscaping. Overview of the ornamental horticulture industry, including marketing, sales, design, and public relations. Field trips required.

HORT 4006. HORTICULTURE PRACTICUM. Three credit hours. A minimum of thirty hours per week during six consecutive weeks. Prerequisite: a minimum of nine credits in Horticulture and authorization of the Director of the Department.

Practical work experience in Horticulture. It is carry out under the supervision of the Department in collaboration with public or private entities.

HORT 4008. VEGETABLE CROPS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study and practice of vegetables growing; varieties, planting, cultivation, and insect and disease problems of the common vegetables; handling for local markets and for shipping. Field trips required.

HORT 4009. HORTICULTURAL CROPS. Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 3005.

A survey course covering some important horticultural enterprises on the island. Coffee, bananas, vegetable crops, and ornamentals will be discussed. Field trips required.

HORT 4014. PLANTS FOR THE LANDSCAPE. Three credit hours. Three hours of lecture per week.

Study of plants as material for landscaping design in Puerto Rico, their identification by scientific and common name, and by aesthetic and botanical characteristics. Emphasis in the selection of plants according to the design needs, uses, and management.

HORT 4015. TROPICAL FRUIT CULTURE I. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study of the most important fruits in Puerto Rico, including pineapple, citrus, avocados, and bananas. Field trips required.

HORT 4016. PRINCIPLES OF LANDSCAPE DESIGN. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 or authorization of the Director of the Department.

Principles and techniques of landscape design; preparation of plans for small areas.

HORT 4018-4019. SPECIAL PROBLEMS. One to three credit hours per semester. One to three research periods per semester. Prerequisite: authorization of the Director of the Department.

Research problems in horticulture selected by the student and the professor. A written report is required.

HORT 4025. FLORICULTURE. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Identification, cultural practices and management of annuals, biennials, perennials, and bulbous cut-flower plants, used for commercial purposes.

HORT 4026. NURSERY MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Principles covering the establishment of nurseries for commercial purposes; the preparation of layout plants both for retail and wholesale nurseries, structures, equipment, operation, and marketing will be discussed. Field trips required.

HORT 4027. FLOWER ARRANGEMENT. Two credit hours. One hour of lecture and one three-hour laboratory per week.

Principles of flower arranging. The management of a flower shop, the handling of plants and flowers, preparation of wreaths, sprays, corsages, etc., floral arrangements for special occasions such as banquets, funeral celebrations, and other events. Visits to flower shop required.

HORT 4028. SEMINAR. One credit hour. One meeting per week. Prerequisite: A minimum of 9 credits approved in Horticulture.

Reports and discussions of assigned or selected readings of investigation related to horticulture problems.

HORT 4029. COFFEE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

The commercial production of coffee (with special consideration given to conditions prevailing in Puerto Rico). The selection of varieties, propagation, planting, fertilization and management. Field trips required.

HORT 4030. POSTHARVEST TECHNOLOGY OF HORTICULTURAL CROPS. Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 4005.

Study of the postharvest technology utilized on horticultural crops, including control of ripening and decay processes, and handling during harvesting, classification, packaging, transportation, and storage. Special attention will be given to tropical and subtropical products. Field trips are required.

HORT 4035. TROPICAL FRUITS CULTURE II. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study of the origin, botany, varieties and production practices of tropical fruits with economic potential in Puerto Rico, such as: papaya, mango, and passion fruit.

HORT 4037. PRINCIPLES OF FRUIT AND VEGETABLE PRESERVATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: QUIM 3002 or (QUIM 3132 and QUIM 3134).

Fundamentals principles of food spoilage, decomposition and changes, methods employed in preserving fruits and vegetables, laboratory work in freezing, canning and dehydration, the common commercial methods of preserving fruits and vegetables. Field trips required.

HORT 4045. STARCHY CROPS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Management and production of starchy crops like plantains, bananas, yams, sweet potatoes, cassava, taro, root celery, and others with economic potential in Puerto Rico. Special attention will be given to the origin, economic situation and perspectives, botanic classification, climatic requisites, crop improvement, propagation, cultural practices, pest and disease control, harvesting, storage, processing, distribution, and marketing.

HORT 4046. INTRODUCTION TO ORGANIC CROPS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study of organic farm management. Application of practices such as crop rotation, intercropping, fertilization, tillage, transplantation, and pest and disease control. Postharvest, marketing, and certification aspects will be studied. Field trips are required.

HORT 4047. PLANT MICROPROPAGATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005 or BIOL 3052 or (BIOL 3062 and BIOL 3064).

Use of tissue culture as a tool in the propagation of plants of economic importance to Puerto Rico such as ornamental plants, starchy crops, fruits, vegetables and aromatic plants.

HORT 4048. CROP PRODUCTION IN HYDROPONICS SYSTEMS. Three credit hours. Two hours of lecture and one three hour laboratory per week. Prerequisite: CFIT 3005 or BIOL 3051 or (BIOL 3061 and BIOL 3063).

Study of theoretical and practical aspects in hydroponic crop production systems. Includes topics such as: nutrient solutions preparation, equipment and infrastructure, integrated pest and disease management, harvest, postharvest management, and marketing.

HORT 4055. AROMATIC PLANTS. Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 3005.

Production and handling of aromatic plants; medicinal, culinary, ornamental and landscape uses.

AGRO/HORT 4066. TURFGRASS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: CFIT 3005 and AGRO 3011 and AGRO 3013.

Study of the physiology, management, and characteristics of tropical and subtropical turfgrasses. establishment, fertilization, irrigation, mowing, and pest and disease control practices will be emphasized.

HORT 4995. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A maximum of two practice period, one of which has to be in a semester. Prerequisites: authorization of the Director of the Department and to be a Coop student.

Practical experience in Horticulture in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator, and an official from the cooperating entity. A written report will be required upon completion of each work period.

HORT 4996. SELECTED TOPICS I. One to three credit hours. One to three hours of lecture per week.

Selected topics in ornamentals, starch and tubers, vegetables, fruits, tissue culture and other related areas.

HORT 4997. SELECTED TOPICS II. One to three credit hours. One to three hours of lecture per week.

Selected topics in ornamentals, starch and tubers, vegetables, fruits, tissue culture and other related areas.

Advanced Undergraduate and Graduate Courses

HORT 5005. ADVANCED FLORICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: HORT 4025 or authorization of the Director of the Department.

A comprehensive review of scientific literature and research on the ecology, physiology, propagation, improvement, and other growth processes of important flowering and foliage plants.

HORT 5006. ADVANCED VEGETABLE GARDENING. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: HORT 4008 or authorization of the Director of the Department.

This course aims to review the different phases of experimental work in vegetable growing with assigned field problems. Field trips required.

HORT 5015. HORTICULTURE OF TEMPERATE ZONES. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Study of the basic and applied concepts in horticulture in temperate zones. Study of the effects of environmental factors on agricultural production and how they affect plant growth and development of fruits, vegetables and ornamental crops, and urban forests. Emphasis will be given to different marketing systems for agricultural products and their postharvest physiology. The course consists of lectures and a ten-day trip to a temperate zone country.

DEPARTMENT OF ANIMAL SCIENCE

Undergraduate Courses

CIAN 3011. FUNDAMENTALS OF ANIMAL SCIENCE. Three credit hours. Three hours of lecture per week.

An introductory course in Animal Sciences of economically important livestock in Puerto Rico.

CIAN 3012. LABORATORY OF PRACTICES IN ANIMAL SCIENCE. One credit hour. Three hour of laboratory per week. Corequisite: CIAN 3011.

Laboratory in management practices in farm animals such as: cattle, swine, equine, caprine, ovine, rabbits, and poultry.

CIAN 3015. FUNDAMENTALS OF PHYSIOLOGY, MANAGEMENT AND CARE OF COMPANION ANIMALS. Three credit hours. Three hours of lecture per week.

Study of anatomy, physiology, management, and care of pets, and ethical issues that relate humans to these animals.

CIAN 3017. RABBIT PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

Theoretical basis and management practices involved in commercial rabbit production, including breeds; reproductive, feeding and sanitary management; genetic improvement; and processing and marketing of the final product.

CIAN 4005. VETERINARY PHYSIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: (CIAN 3011 and CIAN 3012) and (BIOL 4015 or BIOL 3021 or BIOL 3052 or (BIOL 3062 and BIOL 3064)).

The physiology of farm animals, comprising the digestive, nervous, vascular, excretory, respiratory and endocrine systems.

CIAN 4006. REPRODUCTIVE PHYSIOLOGY OF FARM ANIMALS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: (CIAN 3011 and CIAN 3012) and CIAN 4005.

Physiological mechanisms and anatomy of the reproductive system of farm animals, including artificial insemination.

CIAN 4007. ANIMAL SCIENCE PRACTICUM. Three credit hours. A minimum of thirty hours per week during six consecutive weeks. Prerequisites: (INPE{10} or CIAN{10}) and authorization of the Director of the Department.

Practical work experience in animal science. It is carried out under the supervision of the Department in collaboration with public or private entities.

CIAN 4008. MILK AND MILK PRODUCTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

A general course covering the composition and properties of milk, and the manufacture of dairy products.

CIAN 4009. MARKET MILK. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 4008.

Processing and distribution of market milk and related products. Field trips required.

CIAN 4010. ANIMAL FEEDING AND NUTRITION. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

Definitions and general concepts of feeding and nutrition. Relationship between human and animal nutrition. Anatomy and physiology of the digestive tract. Nutrient digestion and absorption and excretion of waste products. Chemical composition and feed evaluation. The nutrients and their metabolism. Feedstuffs used in animal rations. Voluntary feed intake. Feeding standards for domestic animals. Ration formulation. Applied aspects of feeding diary cattle, beef cattle, sheep, goats, horses, poultry, swine, and rabbits.

CIAN 4015. FARM ANIMAL ECTOPARASITES. Three credit hours. Three hours of lecture per week.

Discussion of prevention and control methods of ectoparasites. Study of the economic impact of ectoparasites in animal production.

CIAN 4016. BEEKEEPING. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Breeds and behavior of bees, management and apiculture production techniques. Field trips required.

CIAN 4017. POULTRY PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

The principles and practices of poultry breeding, feeding, incubation, brooding, rearing, housing, and sanitation.

CIAN 4018. PHYSIOLOGY OF LACTATION. Three credit hours. Three hours of lecture per week. Prerequisite: CIAN 4005 (Veterinary Physiology).

Discussion of the mechanisms of the biosynthesis of milk, its biological and chemical properties, its significance on the neonate and human nutrition, immunological mechanisms of the mammary gland, methods of detection of mastitis and management practices for its control in dairy herds. Study of current theories in the origin and evolution, morphology and physiology of the mammary gland among species.

CIAN 4019. ANIMAL BREEDING. Three credit hours. Three hours of lecture per week. Prerequisite: CIAN 3011 and CIAN 3012 and (BIOL 3015 or BIOL 3300).

The application of genetics to the problems and methods of livestock's improvement.

CIAN 4025. DAIRY CATTLE AND MILK PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

A study of the various phases of dairy cattle and milk production.

CIAN 4026. SPECIAL PROBLEMS. One to three credit hours each semester. One to three research periods per week per semester. Prerequisite: authorization of the Director of the Department.

Research problems in livestock feeding and nutrition, poultry feeding and nutrition, livestock management, dairy technology, animal breeding, and animal diseases.

CIAN 4027. SPECIAL PROBLEMS. One to three credit hours each semester. One to three research periods per week per semester. Prerequisite: authorization of the Director of the Department.

Research problems in livestock feeding and nutrition, poultry feeding and nutrition, livestock management, dairy technology, animal breeding, and animal diseases.

CIAN 4028. INTRODUCTION TO HORSE PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

Fundamental principles involved in the care and management of horses with emphasis on racing and the "Paso Fino". Field trips to horse farms and stables required.

CIAN 4029. SWINE AND PORK PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

A study of the various phases of swine production, including butchering, cutting and curing of pork.

CIAN 4030. COMPANION ANIMAL DISEASES. Two credit hours. Two hours of lecture per week. Prerequisite: CIAN 4005.

Study of the diseases that commonly affect the wellbeing of dogs, cats, rabbits, psitaccines, and other species used as companion animals. Discussion of the etiology, pathogenesis, clinical signs, prevention, and treatment of diseases of companion animals.

CIAN 4035. BEEF PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 3011 and CIAN 3012.

A study of the various phases of beef cattle production, including butchering, cutting and curing of beef.

CIAN 4036. DISEASES OF FARM ANIMALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIAN 4005.

The most common diseases of farm animals in Puerto Rico; their prevention, treatment, and sanitary measure.

CIAN 4037. SEMINAR. One credit hour. One meeting per week. Prerequisites: INPE{12} or CIAN{12}.

Studies and discussions of research work and other topics of interest in animal science.

CIAN 4038. SEMINAR. One credit hour. One meeting per week. Prerequisite: CIAN 4037.

Studies and discussions of research work and other topics of interest in animal science.

CIAN 4039. SMALL RUMIANT PRODUCTION. Three credit hours. Three hours of lecture per week. Prerequisites: CIAN 3011 and CIAN 3012.

Management, reproduction, selection, feeding, and diseases of goats and sheep for production under tropical conditions. Field trips are required.

CIAN 4040. BEHAVIOR OF FARM ANIMALS. Three credit hours. Three hours of lecture per week. Prerequisite: CIAN 4005.

Study of the behavior of farm animals; the influence of genetic, and the environment on the animals conduct and the physiological aspects related to these.

CIAN 4046. DAIRY RECORDS. Two credit hours. Two hours of lecture per week. Prerequisites: CIAN 3011 and CIAN 3012 and CIAN 4025.

Analysis, interpretation, and application of the information obtained from production records and computer use for the efficient management of a dairy farm.

CIAN 4050. INTRODUCTION TO AQUACULTURE. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 4015 or BIOL 3021 or BIOL 3022 or BIOL 3425 or BIOL 3052.

Study of the management practices in the culture and production of aquaculture species of economic importance in Puerto Rico. Emphasis will be given to the management of freshwater fish. Field trips are required.

CIAN 4105. DOMESTIC ANIMAL CELL PHYSIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: CIAN 4005 and (QUIM 3061 or QUIM 3461).

Study of organelles, structures and macromolecules that compose eukaryotic cells of domestic animals and their interaction to mediate the eukaryotic cell functionality as individual units. Fundamentals of cell metabolism, transport and signaling between cell compartments. Discussion of basic concepts of cell cycle and protein synthesis. Emphasis on domestic and food source animal models. Introduction to biochemical and molecular biology research techniques used to study eukaryotic cell physiology in animal models.

CIAN 4357. CIAN 4357. PRODUCTS OF ANIMAL ORIGIN. Three credit hours. Three hours of lecture per week. Prerequisites: CIAN 3011 (Fundamentals of Animal Science) and CIAN 3012 (Laboratory Practices in Animal Science).

Analysis of diverse animal origin products, with emphasis on meat, dairy and egg products. Evaluation of slaughter and processing methods of species of major economic importance as well as components relevant to muscle tissue in meat products. Discussion of current and relevant topics that impact these products.

CIAN 4991. SELECTED TOPICS IN ANIMAL SCIENCES I. One to six credit hours. One hour of lecture per credit per week. Prerequisite: authorization of the Director of the Department.

Selected topics in production and management of beef and dairy cattle, poultry, swine, rabbits, bee, ovine, caprine, equine, and other related areas.

CIAN 4995. ANIMAL SCIENCE INTERNSHIP. One to six credit hours. One to six hours of internship per week. Prerequisite: authorization of the Director of the Department.

Work experience in the area of Animal Science, in a business enterprise or a state or federal government agency, under the supervision of a faculty member in coordination with an immediate supervisor at the internship location.

CIAN 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. From three to six credit hours. A maximum of two practice periods, one of which has to be in a semester. Prerequisites: authorization of the Director of the Department.

Practical experience in animal management and production and/or animal products in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator and an official from the cooperating entity. A written report will be required upon completion of each work period.

Advanced Undergraduate and Graduate Courses

CIAN 5005. USE OF ORGANIC BY-PRODUCTS IN ANIMAL NUTRITION. Three credit hours. Three hours of lecture per week. Prerequisite: CIAN 4010 or authorization of the Director of the Department.

Theory, concepts, and applications of the process of conversion of organic by-products into ingredients for animal use and their utilization in commercial feeds for livestock.

CIAN 5045. ENVIRONMENT AND MANAGEMENT OF FARM ANIMALS. Three credit hours. Three hours of lecture per week. Prerequisite: CIAN 4005 or authorization of the Director of the Department.

Study of the effects of the environment on the physiology and behavior of farm animals. Evaluation of management alternatives to minimize adverse environmental effects and to improve the productivity of livestock enterprises.

CIAN 5346. DAIRY BY-PRODUCTS. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: CIAN 4008 or authorization of the Director of the Department.

The manufacture of ice cream, cheese, and butter.

CIAN 5350. VETERINARY CLINICAL PARASITOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: (CIAN 4005 and CIAN 4036) or authorization of the Director of the Department.

Study of the interaction of the most common parasites of veterinary importance in domestic animals and the impact animal production. Discussion and analysis of parasite pathology, clinical manifestations, life cycles and control methods.

CIAN 5355. ADVANCED BEEKEEPING. Three credit hours. Two hours of conference and three hours of laboratory per week. Prerequisite: CIAN 4016 and authorization of the Director of the Department.

Commercial management of apiaries. Including the bees, and the various methods used to obtain honey and wax.

CIAN 5357. SCIENCE AND TECHNOLOGY OF FRESH MEATS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: CIAN 4005 or authorization of the Director of the Department.

Principles and practices in the handling, processing and preservation of beef, pork, and poultry meats.

CIAN 5359. BIOSECURITY AND DISEASE CONTROL. Three credit hours. Three hours of lecture per week. Prerequisites: CIAN 4005 or authorization of the Director of the Department.

Theory about practices in sanitary and management for the control and prevention of farm animal diseases. Discussion of management practices to prevent the transmission of zoonotic diseases.

CIAN 5365. GASTROINTESTINAL MICROBIOLOGY OF DOMESTIC ANIMALS. Three credit hours. Three hours of lecture per week. Prerequisite: (CIAN 4010 and BIOL 3770 and QUIM 3062) or authorization of the Director of the Department.

Discussion of theory related to the microbial ecology of the gastrointestinal tract of domestic animals. Analysis of the role of intestinal microbes in the nutrition, health, and productivity of animals with emphasis on farm animals.

Curricular Sequence in Film Studies

Arts and Sciences Interdisciplinary Courses

CINE 3005. WRITING THE SHORT FILM. Three credit hours. Three hours of lecture per week. Prerequisite: 24 credits approved in undergraduate courses.

Application of theoretical and practical tools used in the different stages of developing a filmscript. Study of specific films, technical and formal aspects of screenwriting and of different theoretical approaches resulting in the creation of a polished screenplay.

CINE 3025. SPECIAL TOPICS. One to nine credit hours. One to nine hours of conference per week. Prerequisites: 24 undergraduate credits.

Study of special topics in film taught via lectures, presentations of films, discussion and/ or group projects. By the end of the course, the student will be able to appreciate and knowledgeably articulate ideas about film and film-related issues. This course is an elective which satisfies the elective requirement for the interdisciplinary sequence in film and video studies.

CINE 4001. FILM HISTORY TO 1950. Four credit hours. Three hours of lecture and three hours of workshop per week. Prerequisites: 48 undergraduate credits.

The history of world cinema from its beginnings to 1950.

CINE 4002. FILM HISTORY FROM 1950. Four credit hours. Three hours of lecture and three hours of workshop per week. Prerequisites: 48 undergraduate credits.

The history of world cinema from 1950 to the present.

CINE 4005. FILM THEORY. Three credit hours. Three hours of lecture per week. Prerequisites: 48 undergraduate credits.

Theoretical concepts and development of critical skills for aesthetic appreciation and analysis of film.

CINE 4015. DIGITAL VIDEOMAKING. Three credit hours. Three hours of lecture per week. Prerequisites: 48 undergraduate credits.

Development of basic skills of videomaking, such as planning the filming of a video and the use of video, sound, lighting, and editing equipment.

CINE 4016. FILM PRODUCTION: THE CREATIVE DOCUMENTARY. Three credit hours. Three hours of lecture per week. Prerequisite: 48 credits approved in undergraduate courses.

Theory and practice of how to creatively produce and direct non-fiction films with special emphasis on the conceptualization and development of ideas, the aesthetics of the image, and the creative processes for making short fiction films.

CINE 4017. FILM PRODUCTION: FICTION. Three credit hours. Three hours of lecture per week. Prerequisite: 48 credits approved in undergraduate courses.

Theory and practice of how to creatively produce and direct fiction films with special emphasis on the conceptualization and development of ideas, the aesthetics of the image, and the creative processes for making short fiction films.

INDUSTRIAL BIOTECHNOLOGY PROGRAM

Undergraduate Courses

BIND 3005. INTRODUCTION TO INDUSTRIAL BIOTECHNOLOGY. Two credit hours. Two hours of lecture per week. Prerequisites: BIOL 3052 and QUIM 3042.

Presentation of biological and chemical principles applied to the development of new biotechnological products in areas such as health, agriculture, and environmental protection. Field trips required.

BIND 4890. SEMINAR. One credit hour. One hour of seminar per week. Prerequisite: Fourth year student in Industrial Biotechnology.

Discussion of current topics in the field of biotechnology. Oral and written reports required.

BIND 4905. PRACTICUM IN INDUSTRIAL BIOTECHNOLOGY. One to six credit hours. From seven to thirty five hours of supervised practice per week. Prerequisite: authorization of the Program Coordinator.

Practical experience in a field of industrial biotechnology to be jointly supervised by a faculty member and an appropriate official of the cooperating organization. Written and oral reports will be required.

Advanced Undergraduate Course

BIND 5005. PROJECT IN INDUSTRIAL BIOTECHNOLOGY. Two credit hours. Two four to eight-hour laboratory or independent study periods per week. Prerequisite: authorization of the Coordinator of the Program after evaluation of student progress.

Undergraduate research in a field of industrial biotechnology. A written report is required.

BIND 5006. ADVANCED INDUSTRIAL BIOTECHNOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: (BIOL 3770 and QUIM 5072 and INQU 5035) or authorization of the Director of the Department.

Integration of knowledge and skills in biology, biochemistry, and chemical engineering for the development of new products in industrial biotechnology. Simulation of an industrial environment for the creation of a biotechnological product, including quality control, process support, validation, and economic impact.

DEPARTMENT OF BIOLOGY

Undergraduate Courses

BIOL 3010. CELL PHYSIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3031 or (QUIM 3461 and QUIM 3462).

Study of the structure and function of life molecules at the cell level, and the interactions among them.

BIOL 3021-3022. ANIMAL BIOLOGY. Three credit hours per semester. Two hours of lecture and one three-hour laboratory per week each semester.

A survey of the animal kingdom, fundamental principles of animal biology, and the uses of the microscope. Structure, functions, habitat, and economic importance of representative groups of animals will be studied in detail. First semester: the nonchordate animals; Second semester: the chordates.

BIOL 3051. GENERAL BIOLOGY I. Four credit hours per semester. Three hours of lecture and one three-hour laboratory per week.

Study of the diversity of organisms, the relationships between them and their environment, the fundamental aspects of their structure and function, and the processes that regulate the perpetuation of life.

BIOL 3052. GENERAL BIOLOGY II. Four credit hours per semester. Three hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3051.

Study of the diversity of organisms, the relationships between them and their environment, the fundamental aspects of their structure and function, and the processes that regulate the perpetuation of life.

BIOL 3055. BIBLIOGRAPHY AND LIBRARY RESEARCH IN BIOLOGICAL SCIENCES. One credit hour. One hour of conference per week.

Introduction to the use of the library: the online catalogue, periodical indices, abstracts, encyclopedias, dictionaries, monographs, and other reference resources in the biological sciences.

BIOL 3056. INTRODUCTION TO FORENSIC MYCOLOGY. Two credit hours. Two hours of lecture - discussion per week. Prerequisites: BIOL 3052.

Introduction to forensic microbiology with emphasis on forensic mycology. Discussion of the historical background of forensic sciences in response to microbiological threats. Analysis of case studies documented in the scientific literature.

BIOL 3061. GENERAL BIOLOGY I. Three credit hours. Three hours of lecture per week. Corequisite: BIOL 3063.

Introduction to concepts, topics and methods of general biology. The processes essential to life will be studied, focusing on the processes that occur at the cellular level. Discussion about cells, their cellular components and the basics processes that they perform for optimal functioning.

BIOL 3062. GENERAL BIOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisites: BIOL 3061 and BIOL 3063. Corequisite: BIOL 3064.

Introduction to the concepts, topics and methods of general biology. Study of evolution and how living organisms are organized on the evolutionary scale, how they are classified, and what are the characteristics used for such purposes. Study of processes and structures in plants and animals. Discussion on biodiversity, the role of human species in the ecosystem and its relevance in the development and degradation of the Earth's resources.

BIOL 3063. LABORATORY OF GENERAL BIOLOGY I. One credit hour. Three hours of laboratory per week. Corequisite: BIOL 3061.

Introduction to the concepts, topics and methods of general biology. Practice of the skills needed to carry out scientific research and to correctly report the results obtained in an investigation. Discussion of the cell, its components and the basic processes it performs for its optimal functioning. Analysis of the cellular processes affecting the development of living beings and the processes involved in the prepetuation of life.

BIOL 3064. LABORATORY OF GENERAL BIOLOGY II. One credit hour. Three hours of laboratory per week. Corequisite: BIOL 3062- General Biology II.

Introduction to concepts and topics related to the evolution of living beings and how organisms have become increasingly complex. Study of the important characteristics that classify the different organisms in their kingdoms, by studying examples of some characteristic organisms. Development of skills in the use and management of the microscope. Practice of dissection techniques and slide preparation of various organisms.

BIOL 3125. PRINCIPLES OF ECOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3062 and Biol 3064) or (BIOL 3043 and BIOL 3044).

The general principles of the interrelation between organisms and their environment.

BIOL 3146. ECONOMIC BOTANY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3052 or BIOL 3435 or (CIBI 3002 or CIBI 3032).

Origin, classification, characteristics, and human utilization of plants and their products. Field trips are required.

BIOL 3206. PRINCIPLES OF MICROSCOPY. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3052 or (BIOL 3062 and BIOL 3064).

History, types, and use of microscopes. Construction, parts, and functions of the compound microscope; techniques to obtain its maximum resolution. Preparation of drawings with the "camera lucida". Basic photomicrography techniques.

BIOL 3225. BIOLOGY OF SEX. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3052 or (BIOL 3062 and BIOL 3064) or authorization of the Director of the Department.

Comparative study of the sexual processes in animals and humans emphasizing the sociobiological and evolutionary aspects.

BIOL 3300. GENETICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: (BIOL 3022 or BIOL 3435 or BIOL 4015 or CIBI 3032 or CIBI 3002 or BIOL 3052) or (BIOL 3062 and BIOL 3064).

Study of nuclear and non-nuclear organisms; their nature and the transmission and mode of action of genetic material.

BIOL 3417. PLANT ORGANISMAL BIOLOGY. Four credit hours. Three lectures and one three-hour laboratory per week. Prerequisites: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) or (BIOL 3043 and BIOL 3044).

An introductory study of the structure and physiology of the flowering plants. A general survey of the plant kingdom, with emphasis on classification, evolution of vegetative and reproductive structures, and the study of selected life cycles.

BIOL 3425. ORGANISMAL ANIMAL BIOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) or (BIOL 3043 and BIOL 3044).

A survey of the different phyla of the animal kingdom. A general account of the morphology, physiology, ecology and evolution of the different groups, with references to their importance to human welfare.

BIOL 3435. ELEMENTARY BOTANY. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

An introductory study of the structure and function of the flowering plants, and a brief survey of the plant kingdom.

BIOL 3715. ANATOMY AND PHYSIOLOGY. Three credit hours. Three hours of lecture per week.

A study of the structure and function of man with emphasis on the physiological principles.

BIOL 3716. ANATOMY AND PHYSIOLOGY LABORATORY. One credit hour. Three hours laboratory per week. Prerequisite or corequisite: BIOL 3715.

Laboratory experiments with emphasis on the study of the structure of the human body.

BIOL 3725. MICROBIOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

A survey of the basic principles of microbiology, with emphasis on the study of microorganisms in relation to human health and disease.

BIOL 3745. AN INTRODUCTION TO MEDICAL MYCOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) or (BIOL 3043 and BIOL 3044).

A study of fungi, with special emphasis on human pathogens. Practice is given in the isolation and identification of the most prevalent fungi.

BIOL 3770. GENERAL MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: (BIOL 3052 or (BIOL 3062 and BIOL 3064) or CIBI 3032 or BIOL 3435) and (QUIM 3132 and QUIM 3134).

The structure, metabolism, growth, genetics, inhibition and death, pathogenecity, taxonomy, and applied considerations of microorganisms.

BIOL 3775. AEROBIOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: (BIOL 3052 or (BIOL 3062 and BIOL 3064) or BIOL 3725 or CIBI 3032) or (BIOL 3435 and BIOL 3770).

Study of biotic agents in the atmosphere, the processes that influence their dispersion and transport, and methods for their identification and the determination of their impact.

BIOL 3785. INTRODUCTION TO MYCOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Introduction to the groups of true fungi and fungal-like protists. The diversity, structure, life cycles, and classification of fungi will be analyzed, in order to identify them and understand their role in terrestrial and aquatic ecosystems.

BIOL 4005. HISTORY OF BIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: (BIOL 3052 or (BIOL 3062 and BIOL 3064) or CIBI 3032) or authorization of the Director of the Department.

Historical development of the principal concepts and theories in biology from its beginnings to the present. A term paper will be required.

BIOL 4008. INMUNOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) and (QUIM 3461 and QUIM 3462).

Humoral and cellular mechanisms of the immune response; applications in medicine and biochemistry; laboratory exercises designed to demonstrate antibody production and specificity.

BIOL 4015. GENERAL ZOOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of modern principles and problems of animal classification, physiology, ecology and evolution. Presented by means of laboratory exercises, demonstrations, and class discussions. For agricultural students other than those taking the Agricultural Sciences Curriculum.

BIOL 4016. HISTOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

The microscopic structure of the fundamental tissues of the animal body, with special attention to the vertebrates.

BIOL 4025. MAN AND THE ECOSYSTEM. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3125.

Analysis of the ecological problems of the contemporary world and possible alternative solutions.

BIOL 4027. INTRODUCTION TO VERTEBRATE EMBRYOLOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: authorization of the Director of the Department.

Elementary principles and fundamental details of the development processes as illustrated by vertebrates. Cell division, germ cell maturation and production, fertilization, cleavage, germ layers, tissue and organ formation. Particular study is made of organogenesis in chick and pig.

BIOL 4038. BIOLOGICAL APPLICATIONS OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: MATE 3172 or MATE 3005 or 6 credits approved in Biology.

Students will learn the theory of extracting information from remotely sensed data, its integration into geographical information system (GIS) databases, and its use for the study and management of biological systems. Students will extract information of biological interest from remotely sensed data and other types of geographic data, will assemble at least one geographic database, and use that geographic database to study the relationships between one or several organisms and several environmental variables.

BIOL 4039. PLANT BIOTECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (BIOL 3052 or (BIOL 3062 and BIOL 3064) or BIOL 3435) and BIOL 3300.

Description and discussion of classical and modern approaches to genetics, as well as Arabidopsis genetics. Identification and description of the tools of molecular biology used in biotechnology, including plant transformation techniques and the analysis of transgenes. Study of bioinformatics and proteomics. Analysis of commercially available transgenic plant products. Discussion of ethical aspects related to plant biotechnology.

BIOL 4327. GENETICS OF THE EVOLUTIONARY PROCESS. Three credit hours. Three hours of lecture per week.

Study of phenotypic and genetic variation in natural populations and its modification due to factors that control biological phenomena, such as population structure, selection, and evolutionary adaptation.

BIOL 4335. EVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: (BIOL 3052 or (BIOL 3062 and BIOL 3064) or CIBI 3032) or authorization of the Director of the Department.

Mechanisms, processes, and consequences of evolution: factors which cause genetic changes in populations; speciation; population genetics; coevolution, evolution, and the inheritance of animal behavior.

BIOL 4355. HUMAN GENETICS. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3300.

A study of inheritance in man. Effects of mutation, selection and racial mixture; the application of genetics to medical problems.

BIOL 4365. MICROBIAL ECOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Physical, chemical and biological factors involved in the development and behavior of microorganisms; their interaction with other organisms in nature, and their role in the environment.

BIOL 4366. FOOD MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Study of microorganisms in processed and non-processed foods.

BIOL 4367. INDUSTRIAL MICROBIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3770.

The biological activities of microorganisms; their importance in the pharmaceutical, food industries, and related areas.

BIOL 4368. MICROBIAL PHYSIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3770.

Chemical and structural composition of microorganisms. Emphasis will be given to their physiological and genetical properties and mechanisms valuable to mankind.

BIOL 4369. PRACTICE IN INDUSTRIAL MICROBIOLOGY. Two credit hours. Four to six hours of practice per week. Prerequisites: BIOL 3770 and BIOL 4367.

Practical experience in Industrial Microbiology in cooperation with private industries or with government.

BIOL 4375. CLINICAL MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Etiology, pathogenicity, epidemiology, and laboratory analysis for the diagnosis of diseases caused by microorganisms. Emphasis will be placed on those diseases of high incidence in Puerto Rico.

BIOL 4376. FRESHWATER BIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3770 and BIOL 3125.

Analysis of the freshwater ecosystem and its importance to human life. Field work is required.

BIOL 4426. ANIMAL PARASITOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3052 or (BIOL 3062 and BIOL 3064) or CIBI 3032) or BIOL 3022 or BIOL 4015.

General principles and origin of parasitism. Study of the principal pathogenic protozoas and helminths, their life cycles, host relationships and control measures.

BIOL 4428. GENERAL ORNITHOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

Introduction to the study of birds, their structure, classification, ecological relations, and economic status. Considerable field work is done, and practice is given in the methods of collection and preparation of study skins.

BIOL 4446. INTRODUCTION TO ENTOMOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425 or BIOL 4015.

An introduction to entomology based on the study of the biology of insects. Students are required to make an insect collection, and practice is given in the determination and recognition of the most important orders and families.

BIOL 4465. TAXONOMY OF VASCULAR PLANTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417 or BIOL 3052 or (BIOL 3062 and BIOL 3064).

The principles of taxonomy and their application. A general survey of the groups of vascular plants, with the identification and classification of representatives of the local flora. Field trips.

BIOL 4467. COMPARATIVE VERTEBRATE ANATOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

Comparative anatomy of typical vertebrates; interrelation of organ systems of various groups of vertebrates.

BIOL 4505. HUMAN PHYSIOLOGY. Four credit hours. Three hours of lecture, and one three-hour laboratory per week. Prerequisites: CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) and (QUIM 3461 and QUIM 3462).

Physiological principles of the human body.

BIOL 4556. COMPARATIVE VERTEBRATE PHYSIOLOGY. Three credit hours. Three hours of lectures per week. Prerequisite: (QUIM 3461 and QUIM 3462) or QUIM 3071.

Study of the fundamental physiological principles of the vertebrate body.

BIOL 4557. COMPARATIVE VERTEBRATE PHYSIOLOGY LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisite or corequisite: BIOL 4556.

Laboratory experiments involving fundamental physiological principles of the vertebrate body.

BIOL 4607. MARINE ECOSYSTEMS OF PUERTO RICO. Three credit hours. Two hours of lecture and one three-hour laboratory and/or field trips per week. Prerequisites: BIOL 3125 and BIOL 3425.

Ecology of shallow marine ecosystems of Puerto Rico: predominant flora and fauna, population fluctuations, effects of physical factors, life strategies, and environmental disturbances.

BIOL 4725. MICROTECHNIQUE. Two credit hours. Two three-hour laboratories per week. Prerequisite: BIOL 3417 or BIOL 3435 or BIOL 3022 or BIOL 3425.

The making of histological preparations of both plant and animal materials, including: (1) use of the aceto-carmine and other smear techniques, (2) the preparation of plant materials by use of the sliding microtome, and (3) the paraffin method, including killing, fixing, embedding, sectioning, staining and mounting of plant and animal tissues for microscopic examination.

BIOL 4735. MICROBIOLOGY OF WATER AND SEWAGE. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The fundamental principles of microbiology as they affect engineering problems encountered in connection with water supplies and sewage. Primarily for students in Civil Engineering.

BIOL 4746. ECONOMIC MYCOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) or (BIOL 3043 and BIOL 3044).

A study of fungi, with emphasis on their economic importance. Fungi will be studied as they relate to food production, industrial processes, agriculture, medicine and also as a food source.

BIOL 4761. HUMAN ANATOMY I. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisite: BIOL 3425 or BIOL 4505 and (QUIM 3463 and QUIM 3464).

Human anatomy, including neuroanatomy and osteology of the head, the neck, and the extremities.

BIOL 4762. HUMAN ANATOMY II. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisite: BIOL 3425 or BIOL 4505 and (QUIM 3463 and QUIM 3464).

Human anatomy, including the great body cavities (thoracic, abdominal, pelvic) and their parieties.

BIOL 4778. DAIRY BACTERIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

The relation of microorganisms to milk and milk products from the standpoint of economic dairy bacteriology, and also of milk hygiene and sanitary control.

BIOL 4901. SPECIAL PROBLEMS IN BIOLOGY. One to three credit hours per semester. One to three hours of lecture per week. Prerequisites: Twelve credits in Biology and authorization of the Director of the Department.

Short research problems will be assigned or may be selected, subject to approval by the instructor. A written report is required upon the completion of the work assigned or selected.

BIOL 4902. SPECIAL PROBLEMS IN BIOLOGY. One to three credit hours per semester. One to three hours of lecture per week. Prerequisites: Twelve credits in Biology and authorization of the Director of the Department.

Short research problems will be assigned or may be selected, subject to approval by the instructor. A written report is required upon the completion of the work assigned or selected.

BIOL 4925. SEMINAR. One credit hour. Two hours of lecture per week.

Discussion of recent literature in biology and related fields.

BIOL 4991. SPECIAL TOPICS IN BIOLOGY: LAB. One to six credit hours. One to six two-to six-hour laboratories per week. Prerequisite: authorization of the Director of the Department.

Selected topics in biology, botany, microbiology, or zoology.

BIOL 4993. SPECIAL TOPICS IN BIOLOGY I. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in biology, botany, microbiology, or zoology.

BIOL 4994. SPECIAL TOPICS IN BIOLOGY II. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in biology, botany, microbiology, or zoology.

BIOL 4998. COOP PRACTICE. One to six credit hours. Supervised practice in private industry or government. Prerequisite: authorization of the Director of the Department.

Practical experience in biology in cooperation with the private industry or government to be jointly supervised by the academic department, the CO-OP program coordinator, and an official from the cooperating organization.

CIBI 3031. INTRODUCTION TO THE BIOLOGICAL SCIENCES I. Three credit hours. Two hours of lecture and two hours of laboratory per week.

Fundamental biological principles as inferred from the study of the diversity of living organisms and their relationships. Topics include: biological concepts and methods; the chemistry, structure, and function of cells; cell division and principles of genetics.

CIBI 3032. INTRODUCTION TO THE BIOLOGICAL SCIENCES II. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: CIBI 3031.

Fundamental biological principles as inferred from the study of the diversity of living organisms and their relationships. Topics include: evolution; the systems and processes of the human body; ecology and conservation biology.

Advanced Undergraduate and Graduate Courses

BIOL 5005. ELEMENTARY PLANT ANATOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

The study of simple and complex tissues of the organs of vascular plants; the study of the characteristics of parenchyma, sclerenchyma and collenchyma cells, as well as the elements composing the xylem and phloem tissues.

BIOL 5007. GENERAL PLANT MORPHOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

The general principles of plant morphology, including evolutionary tendencies, phylogenetic lines and the life cycles of the principal groups of plants.

BIOL 5016. PLANT EVOLUTION. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

Analysis of the geological, morphological, anatomical, physiological, and geographical evidence showing how the different plant phyla have evolved, with emphasis on the evolution of tracheophytes. Assigned reading reports.

BIOL 5018. PLANT PHYSIOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department. Corequisite: QUIM 3032 or QUIM 3062 or QUIM 3463 or authorization of the Director of the Department.

Plant physiology: diffusion, transpiration, absorption and transport, mineral nutrition, metabolism, growth and development, hormones, effects of environmental factors.

BIOL 5038. BIOLOGICAL APPLICATIONS OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: MATE 3172 or MATE 3005 or authorization of the Director of the Department.

Students will learn the theory of extracting information from remotely sensed data, its integration into geographical information system (GIS) databases, and its use for the study and management of biological systems. Students will

extract information of biological interest from remotely sensed data and other types of geographic data, will assemble at least one geographic database, and use that geographic database to study the relationships between one or several organisms and several environmental variables.

BIOL 5045. SCANNING ELECTRON MICROSCOPY (SEM). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Theoretical and practical aspects of the scanning electron microscope (SEM) with emphasis on sample preparation for SEM, detection of the different types of signals emitted by the specimen, and image analysis.

BIOL 5055. EUKARYOTIC MOLECULAR GENETICS. Three credit hours. Three hours of lecture per week. Prerequisites: (BIOL 3300 and QUIM 5071) or authorization of the Director of the Department.

The eukaryotic genome, gene structure, transposable elements, regulation of transcription, mRNA processing, signal transduction and the genetics of development the cell cycle, and cancer. Discussion of research techniques in molecular genetics.

BIOL 5056. EUKARYOTIC MOLECULAR GENETICS LABORATORY. Two credit hours. Eight hours of laboratory per week. Prerequisites: (BIOL 3300 and QUIM 5071) or authorization of the Director of the Department. Corequisite: BIOL 5055.

Techniques used in eukaryotic molecular genetics such as: DNA preparation, polymerase chain reaction, restriction mapping, gene cloning, DNA sequencing, and construction of genomic and CDNA libraries.

BIOL 5057. INTRODUCTION TO BIOLOGICAL SEQUENCE ANALYSIS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: BIOL 3300 or authorization of the Director of the Department.

Use of bioinformatics programs for the retrieval manipulation, and analysis of DNA and protein sequences. The subjects include: description of sequence data editing software, sequence database searches (nucleotide, proteins and genomes), comparative sequence alignments, applications for the design of specific or degenerate oligonucleotides for the detection of DNA sequences via PCR, and construction of phylogenetic trees using distance, parsimony and maximum likelihood methods.

BIOL 5116. MOLECULAR BASIS OF EUKARYOTIC CELL SIGNALING. Three credit hours. Three hours of lecture per week. Prerequisites: BIOL 3010 or BIOL 4008 or QUIM 5071 or authorization of the Director of the Department.

Principles of molecular signaling regulating membrane, cytoplasmic and nuclear events in eukaryotic cells. Emphasis on contemporary research methods and the principles of identifying and solving problems related to cellular signal transduction.

BIOL 5117. CELLULAR AND MOLECULAR BIOLOGY OF CANCER. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3010 or authorization of the Director of the Department.

Discussion of topics related to cancer research and its clinical application. Emphasis on molecular mechanisms that lead to cancer development and tumor progression and how they relate to the clinical course of the disease. Discussion of recent discoveries in the area.

BIOL 5226. GENETICS AND EVOLUTION OF HUMAN POPULATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: (BIOL 3300 or (CIBI 3032 and ANTR 3015)) or authorization of the Director of the Department.

Study of the biology of human populations, mainly from a genetic and evolutionary perspective. Includes the study of genetic elements, their evolution and their use in studies of the evolution and dispersal of human populations and domesticated species.

BIOL 5399. EUKARYOTIC GENOME ANNOTATION. Two credit hours. One hour of lecture and three hours of research per week. Prerequisite: BIOL 3300 or authorization of the Director of the Department.

Practical course covering the annotation of genomic fragments in different eukaryotic species, using the genome of an evolutionarily closely related species as a reference sequence. Includes the detailed study of the structure of diverse genetic elements, molecular evolution processes, and the use of applications and computer programs useful for studies in genomics. A final report is required.

BIOL 5416. HERPETOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of the biology, classification and morphology of amphibians and reptiles, with emphasis on local species. Field trips.

BIOL 5417. ICHTHYOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of the biology, classification and morphology of fishes, with emphasis on local species. Field trips.

BIOL 5585. MEDICAL AND VETERINARY ENTOMOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

This course offers the student interested in entomology, animal husbandry or veterinary science, an opportunity to become familiar with the recognition, characteristics, habits and control of insects, ticks mites, and other arthropods that attack man and domestic animals.

BIOL 5755. VIROLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770 or authorization of the Director of the Department.

The classification, structure, physiology and biochemical activities of viruses.

BIOL 5758. BACTERIAL GENETICS. Two credit hours. Two hours of lecture per week. Prerequisites: BIOL 3300 or BIOL 3770 or authorization of the Director of the Department.

DNA replication and expression in the prokaryotic cell; transfer of genetic information; the impact of genetic processes on the physiology and ecology of bacteria.

BIOL 5760. BACTERIAL GENETICS LABORATORY. One credit hour. One four hour laboratory per week. Corequisite: BIOL 5758.

Molecular techniques for the study of the genetics of bacteria and bacteriophages. Practical experiences in the processes of recombination, complementation, the control of genetic expression, and the transmission of genetic information among microorganisms.

BIOL 5765. MYCOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770 or authorization of the Director of the Department.

A study of the morphology, physiology, classification and relation of fungi to man. Emphasis is given to the isolation and identification of the different groups.

BIOL 5815. ANIMAL BEHAVIOR. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of activities and responses of animals in meeting their life requirements. Field trips.

BIOL 5955. INTRODUCTION TO RESEARCH METHODS IN ECOLOGY. Three credit hours. One hour of lecture and two three-hour laboratory periods per week. Prerequisite: BIOL 3125 or authorization of the Director of the Department.

Field and laboratory exercises serve to introduce the student to the basic methods used in ecological research. The student is trained in the use of computers for the analysis of ecological data.

BIOL 5990. FIELD BIOLOGY WORKSHOP. One to three credit hours. Thirty to sixty hours of workshop/practice per credit. Prerequisite: authorization of the Director of the Department.

Intensive practical experience in selected areas of field biology, in or outside of Puerto Rico. A final written report will be required.

BOTANY

Undergraduate Course

BOTA 4995. SPECIAL PROBLEMS IN BOTANY. One to three credit hours per semester. One to three research classes per week each semester. Prerequisite: Authorization of the Director of the Department.

Designed for students prepared to undertake special problems or investigations. A written report is required upon completion of the course.

BOTA 4996. SPECIAL PROBLEMS IN BOTANY. One to three credit hours per semester. One to three research classes per week each semester. Prerequisite: Authorization of the Director of the Department.

Designed for students prepared to undertake special problems or investigations. A written report is required upon completion of the course.

ZOOLOGY

Advanced Undergraduate and Graduate Course

ZOOL 5005. INVERTEBRATES OF PUERTO RICO. Three credit hours. Two hours of lecture and one-three hour laboratory per week.

Taxonomy and ecology of the most common invertebrates of Puerto Rico, especially Arthropoda (exclusive of insects and marine forms) and Mollusca. Field trips.

DEPARTMENT OF CHEMISTRY

Undergraduate Courses

QUIM 3025. ANALYTICAL CHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

General concepts of quantitative chemical analysis with emphasis on classical methods including volumetric and gravimetric analysis and chemical equilibria.

QUIM 3041. GENERAL CHEMISTRY I. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Corequisite: MATE 3171 or MATE 3005 or MATE 3143 or MATE 3173.

Qualitative and quantitative aspects of fundamental chemical principles, emphasizing the relationship between the chemical behavior of matter and its atomic and molecular structure. Topics include dimensional analysis, atomic theory, and stoichiometry.

QUIM 3042. GENERAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3041.

Qualitative and quantitative aspects of fundamental chemical principles, emphasizing the relationship between the chemical behavior of matter and its atomic and molecular structure. Topics include colligative properties, chemical kinetics, and chemical equilibrium.

QUIM 3055. ANALYTICAL CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

A study of fundamental topics in analytical chemistry. Emphasis will be given to both theory and practice of current instrumental methods of analysis.

QUIM 3061. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

Principles of organic chemistry; the chemistry of organic functional groups and reaction mechanisms, emphasizing their importance in biochemistry.

QUIM 3062. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3061.

Fundamental concepts of biochemistry; the nature and properties of compounds of biochemical interest.

QUIM 3065. ANALYTICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3025.

Theory and practice of optical spectroscopy, electroanalytical methods, and modern separation techniques.

QUIM 3071. ORGANIC CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week per semester. Prerequisites: QUIM 3042 or QUIM 3002 or (QUIM 3132 and QUIM 3134). For chemistry majors.

A study of the reactions, methods of preparation and theories on structure of organic compounds, with emphasis on the mechanisms of organic reactions.

QUIM 3072. ORGANIC CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week per semester. Prerequisite: QUIM 3071.

A study of the reactions, methods of preparation and theories on structure of organic compounds, with emphasis on the mechanisms of organic reactions.

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 3131. GENERAL CHEMISTRY I. Three credit hours. Three hours of lecture per week. Corequisites: QUIM 3133 and (MATE 3171 or MATE 3005 or MATE 3143 or MATE 3173).

Introduction of the fundamental principles of chemistry. Liquids, solids and properties of gases; changes of matter states. Stoichiometry, atomic theory, molecular structure and chemical properties. Periodic classification and the electronic theory of the ionic and covalent bonds.

QUIM 3132. GENERAL CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3131 and QUIM 3133. Corequisite: QUIM 3134.

Introduction to thermodynamics, solutions, kinetics, chemical equilibrium, oxidation-reduction. Electrochemistry.

QUIM 3133. GENERAL CHEMISTRY LABORATORY I. One credit hour. One three- hour laboratory per week. Corequisites: QUIM 3131 and (MATE 3171 or MATE 3005 or MATE 3143 or MATE 3173).

This laboratory responds to the course QUIM 3131 whose description is the following: Introduction of the fundamental principles of chemistry. Liquids, solids and properties of gases; changes of matter status. Stoichiometry, atomic theory, molecular structure and chemical properties. Periodic classification and the electronic theory of the ionic and covalent bonds.

QUIM 3134. GENERAL CHEMISTRY LABORATORY II. One credit hour. Three hours of laboratory per week. Prerequisite: QUIM 3001 or (QUIM 3131 and QUIM 3133). Corequisite: QUIM 3132.

This laboratory responds to the course QUIM 3132 whose description is the following: Introduction to thermodynamics, solutions, kinetics, chemical equilibrium, oxidation-reduction.
Electrochemistry.

QUIM 3141. PRINCIPLES OF GENERAL, ORGANIC AND BIOLOGICAL CHEMISTRY I. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Principles of organic and biochemistry with emphasis on biological applications. Topics include: atoms, molecules, chemical equations, states of matter, solutions, kinetics and equilibrium.

QUIM 3142. PRINCIPLES OF GENERAL, ORGANIC AND BIOLOGICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3141.

Principles of organic and biochemistry with emphasis on biological applications. Topics include: organic functional groups, carbohydrates, lipids, proteins, enzymes, and nucleic acids.

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 3336. INTRODUCTORY FOOD CHEMISTRY LABORATORY. One credit hour. Three hours of laboratory per week. Corequisite: QUIM 3335.

Introduction to the study and analysis of chemical and functional properties of macromolecules found in food. Application of fundamental techniques in bromatological analysis for the determination of moisture, protein, fiber, ash, lipids, and other methods for macromolecule identification in food. The processing impact on the functionality of food products will be considered as well.

QUIM 3450. FUNDAMENTALS OF ORGANIC CHEMISTRY. Five credit hours. Four hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134).

Properties, reactions, synthesis, and reaction mechanisms of organic compounds.

QUIM 3461. ORGANIC CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or (QUIM 3132 and QUIM 3134).

Nomenclature, structure, preparation, and reactions of non-aromatic and alkyl halides.

QUIM 3462. ORGANIC CHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Corequisite: QUIM 3461.

Experimental techniques in organic chemistry: separation; purification; reactions of nonaromatic hydrocarbons and alkyl halides; polarimetry.

QUIM 3463. ORGANIC CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3461.

Nomenclature, structure, preparation, and reactions of aromatic hydrocarbons, alcohols, ethers, carbonyl compounds, carboxylic acids, amines, and related compounds; biological compounds.

QUIM 3464. ORGANIC CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM 3462. Corequisite: QUIM 3463.

Experimental techniques in organic chemistry: identification and preparation of organic compounds; spectroscopy.

QUIM 4000. INTERMEDIATE INORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4041.

A study of the elements and their inorganic compounds based on modern concepts of atomic and molecular structure.

QUIM 4007. INORGANIC CHEMISTRY LABORATORY. One credit hour. Four hours of laboratory per week. Corequisite: QUIM 4000.

Inorganic chemistry laboratory including synthesis of inorganic compounds and the study of their spectroscopic properties.

QUIM 4015. INSTRUMENTAL METHODS OF ANALYSIS. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3065.

Theory and practice of atomic and molecular spectroscopic methods, mass spectrometry, ion and surface science techniques, and current topics in instrumental analytical chemistry.

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 4041. PHYSICAL CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134)) and (FISI 3151 or FISI 3171 or FISI 3011 or FISI 3032). Corequisite: MATE 3063 or MATE 3048 or MATE 3185.

Fundamentals and laws of classical thermodynamics applied to ideal and real gases, phase equilibrium, chemical equilibrium, heterogeneous equilibrium of binary systems, and solutions.

QUIM 4042. PHYSICAL CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 4041 and (MATE 3063 or MATE 3048 or MATE 3185).

Chemical kinetics, molecular kinetic theory of gases, introduction to quantum mechanics and its application to vibrational, rotational, and electronic spectroscopy.

QUIM 4055. INTRODUCTION TO BIOCHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3072 or QUIM 3450 or QUIM 3463.

Fundamental basics of structure, conformation and function of biological molecules. Design and organization of vital processes.

QUIM 4057. PHYSICAL CHEMISTRY: APPLICATIONS TO BIOTECHNOLOGY. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3032 and (QUIM 3042 or QUIM 3002) and (FISI 3152 or FISI 3162 or FISI 3172).

Study of the principles and applications of physical chemistry that are used to solve problems in biotechnology. Fundamental concepts of classical thermodynamics, chemical kinetics, quantum mechanics, and spectroscopy and their application to biological problems.

QUIM 4101. PHYSICAL CHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Prerequisites: QUIM4041 and (QUIM3055 or QUIM3025).

Experimental determination of thermodynamic properties such as vapor pressure, partial molar volume, enthalpy of reaction, heat capacity, eutectic composition, and equilibrium constants.

QUIM 4102. PHYSICAL CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM4101. Corequisite: QUIM 4042.

Use of spectroscopic, kinetic, electrochemical, surface, polarimetric, and computational methods to determine physical and chemical properties.

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 4125. BIBLIOGRAPHY AND SEMINAR IN CHEMISTRY. Two credit hours. Two ninety-minute periods per week. Prerequisite: twenty credit hours of chemistry.

Techniques of searching the chemical literature. The student will give a short oral presentation on a recently published paper, and prepare and discuss a review paper on a topic selected by him and approved by the instructor.

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.

Advanced Undergraduate and Graduate Courses

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 QUIM 3061)) 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 techninques 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 or authorization of the Director of the Department.

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 3042 or QUIM 3002) or (QUIM 3132 and QUIM 3134)) and (MATE 3183 or MATE 3031 or MATE 3144)) or authorization of the Director of the Department.

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 3450 or QUIM 3032 or QUIM 3072 or QUIM 3463)) or authorization of the Director of the Department.

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 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 detention 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.

DEPARTMENT OF ECONOMICS

Undergraduate Courses

ECON 3021. PRINCIPLES OF ECONOMICS: MICROECONOMICS. Three credit hours. Three hours of lecture per week.

Introduction to microeconomics emphasizing supply and demand, costs of production, and price and output determination under different market structures.

ECON 3022. PRINCIPLES OF ECONOMY: MACROECONOMICS. Three credit hours. Three hours of lecture per week.

Introduction to macroeconomics, emphasizing social accounting, equilibrium, income and output determination, unemployment, inflation, the financial system, and economic policy.

ECON 3085. ECONOMIC AND SOCIAL DEVELOPMENT OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

The evolution of the economic system of Puerto Rico, an analysis of its history, structural development, and fundamental problems.

ECON 3086. CONTEMPORARY PROBLEMS OF THE PUERTO RICAN ECONOMY. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3085.

Analysis of the contemporary Puerto Rican economy and its problems.

ECON 3091. MICRO-ECONOMIC THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

A study of modern microeconomic theory; an analysis of price determination under different market structures.

ECON 3092. MACRO-ECONOMIC THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3022.

In this course, an analysis is made of the economic determinants of the level, change and growth of production and employment. Special emphasis is given to modern theories and their policy implications.

ECON 3095. SECURITIES MARKETS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Nature and function of operations, and regulation of the securities' markets.

ECON 4006. BUSINESS CYCLES. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic factors that affect fluctuations in income, production, employment, and prices; theories that explain this phenomenon; counter-cyclical policy.

ECON 4007. QUANTITATIVE METHODS IN ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022 and (MATE 3101 or ESMA 3101).

Application of the concepts and techniques of quantitative analysis to the field of economics; quantitative aspects of demand-supply analysis, production functions, design of economic models, and other topics.

ECON 4009. ECONOMICS OF REGULATION AND ANTITRUST. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Applications of economic theory and analysis to understand the rationale for and consequences of governmental regulation and antitrust policies that directly affect the market power of firms and industries. Discussion of the main antitrust statutes and public policy in the areas of social and economic regulation and deregulation of different industries.

ECON 4015. ECONOMIC DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A study of the common characteristics of underdeveloped countries, with emphasis on the economic theories explaining the factors that determine economic development; an examination of economic policies designed to foster development.

ECON 4016. MANAGERIAL ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3091.

Economic techniques necessary for directing and operating business enterprises including mathematical programming, marginal economic analysis, capital budgeting, and evaluation of potential investments under conditions of risk.

ECON 4017. ECONOMETRICS. Three credit hours. Three hours of lecture per week. Pre-requisites: ECON 3091 and ECON 3092. Co-requisites: ESMA 3102 or ESMA 4002 or ESTA 3002 or INCI 4136 or ININ 4020.

Analysis applied to economic questions: model building, hypothesis testing, estimation techniques, and data problems.

ECON 4018. ECONOMICS OF THE PUBLIC SECTOR. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Analysis of the role of government in a market economy and the effects of government policies on resource allocation and income distribution. Analysis of the economic basis of government activities through discussion of issues such as efficiency, market failure, externalities, public goods, public choice, and political process. Application of economic theory to public expenditures programs referring to social policy issues.

ECON 4025. MONEY AND BANKING. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The origin and development of money and banking with emphasis on the functions of the monetary and banking systems, central banking, especially the Federal Reserve System, domestic and international monetary institutions, and the present banking laws in Puerto Rico.

ECON 4027. TRANSPORTATION ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Analysis of the economic structure of the transportation system and its significance in competition, monopoly, and economic organization.

ECON 4028. ECONOMICS OF NATURAL RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic analysis of natural resources: their valuation, conservation, and sustainable development.

ECON 4037. URBAN ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Urban issues in a microeconomic framework with emphasis on Puerto Rico. Topics include market forces and the development of cities, urban land-use patterns, transportation, and poverty.

ECON 4038. ECOLOGICAL ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Study of the principles, problems, and applications of ecological economics. Discussion of the interrelationship between the economic and ecological systems, environmental services, economic growth, and sustainable development, among other topics. Examination and formulation of possible courses of action that help to reestablish the balance between the economic, social, and ecological systems.

ECON 4045. COMPARATIVE ECONOMIC SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A comparative study of the different economic systems such as capitalism, socialism, communism and fascism. Emphasis is placed on the different methods used by each system to solve the fundamental economic problems.

ECON 4046. INPUT-OUTPUT ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021, ECON 3022 and MATE 3000.

Theoretical foundations, methods, techniques, and applications of economic analysis using the Input-Output Model.

ECON 4047. ECONOMICS OF ELECTRONIC COMMERCE AND THE INTERNET. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Application of economic principles and models to understand the growth and future of electronic commerce and the Internet. Discussion and analysis of market structure, competitive strategies, regulation, and applications.

ECON 4055. HISTORY OF ECONOMIC THOUGHT. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The course studies the beginning and growth of Economics as a scientific study, and shows the relationship between economic beliefs, historical circumstances and the life of the thinker. The different economic schools of thought, up to and including the more recent economic ideas are considered.

ECON 4056. ENVIRONMENTAL ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Impact of economic development and population growth on environmental quality; the economic analysis of pollution; the role of government in environmental deterioration; and the international environmental issues.

ECON 4065. ECONOMICS OF THE PUBLIC SECTOR AND FISCAL POLICY. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Analysis of government income and expenditures and the impact of fiscal policy on output, employment, prices, and other economic variables.

ECON 4068. ECONOMICS OF TOURISM. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Application of economic principles and techniques in order to understand the complexities of the tourism industry. Discussion of the factors that determine demand and supply in tourism, the costs and benefits of tourism projects, as well as the industrial interaction of airlines, cruises, lodging and other intermediary sectors. Study of aggregate measurement of tourism and the determinants that sustain the competitiveness of the destination such as the role of the government, exchange rate fluctuations, the importance of foreign direct investment and the protection of the environment, among others.

ECON 4074. ECONOMICS AND LAW. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Discussion about how economics can be used to understand how the legal system functions. Application of the economic principles and techniques to evaluate a variety of topics related to the discipline of law which allows a better understanding of the economic consequences within law.

ECON 4085. INTERNATIONAL ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A study of the fundamental aspects of international economic theory; an examination of the current international economic framework and tendency towards economic integration; a brief analysis of the aspects and problems of the international monetary system.

ECON 4185. ECONOMIC PROBLEMS OF LATIN AMERICA. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic problems of Latin America; critical evaluation of the institutions and economic factors that retard or foster their solution; the role of the State in promoting economic development.

ECON 4196. ECONOMICS OF INDUSTRIAL ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Conduct, performance and use of price theory in the determination of industrial structure. Economic aspects of market structure, mergers and innovations, models of economic behavior, and the role of advertising.

ECON 4225. LABOR ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Theory of labor market behavior and its applications to public policy. Topics include labor supply and demand, human capital theory, migration, unemployment, unions, and discrimination.

ECON 4307. PROJECT EVALUATION. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Evaluation of public investment projects emphasizing cost-benefit analysis and its application.

ECON 4316. STRATEGIC PROSPECTIVE AND SCENARIO BUILDING. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021- Principles of Economy: Microeconomics and ECON 3022- Principles of Economy: Macroeconomics.

Description of conceptual, theoretical and methodological principles of prospective strategy and scenario building. Explanation of the method's historical development, schools of thought and their proponents. Analysis of case studies in the public and private spheres and the application of the method of scenario building with emphasis on Puerto Rico.

ECON 4391. RESEARCH METHODS IN ECONOMICS I. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 4017.

Discussion of the research process in the study of economic problems with emphasis on the scientific approach, research design, measurement concepts and analytical approaches. A research proposal is required.

ECON 4392. RESEARCH METHODS IN ECONOMICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 4391.

Development and presentation of a research project in a field of economics.

ECON 4405. ANALYSIS OF CONTEMPORARY ECONOMIC PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and (MATE 3102 or ESMA 3102).

A study of the fundamental economic problems of our time, such as production, employment, trade, consumption, inflation, and others.

ECON 4425. SPECIAL TOPICS. One to three credit hours. One to three hours of lecture or seminar per week. Prerequisite: authorization of the Director of the Department.

Authors, topics, and trends in the field of economics.

ECON 4995. SPECIAL PROBLEMS. One to three credit hours. Three to nine hours of research per week. Prerequisite: authorization of the Director of the Department.

Research under the supervision of a professor of the Department.

DEPARTMENT OF ENGLISH

Undergraduate Courses

INGL 3046. LITERATURE FROM BRITISH POSTCOLONIES. Three credit hours. Three hours of lecture per week.

An introduction to and study of the major topics that characterize Anglophone literature in postcolonies that were colonies or dependent states of the British empire, including Canada, Australia, and New Zealand; and in particular, non-settler colonies in Sub-Saharan Africa, the Indian subcontinent, the Caribbean and Eire.

INGL 3056. INTRODUCTION TO THE COMMUNICATION PROCESS. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Critical analysis of the process of communication. Study and evaluation of communication as a social process, theories of communication, and the communication process in diverse contexts.

INGL 3057. MEDIA LITERACY. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3056 or INGL 3268 or authorization of the Director of the Department.

Development of critical literacy skills required to comprehend mass media messages. Identification of rhetorical, production and ideological devices used in the construction of meaning in media. Acquisition of new communication competencies to access, analyze, evaluate and present analysis of media texts such as print media, advertisements, television, film, music videos and public relations material. Study of the interaction of language and visual communication with the cultural environment.

INGL 3101. BASIC COURSE IN ENGLISH. Three credit hours per semester. Three hours of lecture per week, supplemented by work in the language laboratory, each semester.

This course is designed to meet the student's immediate needs, and to give him or her a command of the fundamental structure of the English language. The oral approach is used. Skills in reading and writing are developed. Students will be grouped according to their ability to use the language, and arrangements will be made to give additional help to those students who show poor preparation in English.

INGL 3102. BASIC COURSE IN ENGLISH. Three credit hours per semester. Three hours of lecture per week, supplemented by work in the language laboratory, each semester. Prerequisite: INGL 3101.

This course is designed to meet the student's immediate needs, and to give him or her a command of the fundamental structure of the English language. The oral approach is used. Skills in reading and writing are developed. Students will be grouped according to their ability to use the language, and arrangements will be made to give additional help to those students who show poor preparation in English.

INGL 3103. INTERMEDIATE ENGLISH I. Three credit hours. Three hours of lecture per week. Prerequisite: Placement by examination.

Analysis of selected readings, such as essays, fiction, poetry or drama, and practice in writing compositions with attention given as needed to grammar and idiomatic expressions.

INGL 3104. INTERMEDIATE ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3103.

Analysis of selected readings, such as essays, fiction, poetry or drama, and practice in writing compositions with attention given as needed to grammar and idiomatic expression.

INGL 3175. POETRY WRITING. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisites: INGL 3103 and INGL 3104 or INGL 3211 and INGL 3212.

Intensive individual work and group workshop in poetry writing techniques.

INGL 3195. PROFESSIONAL CONVERSATION. One credit hour. One hour of lecture per week. Prerequisites: INGL 3012 or INGL 3212 or INGL 3202 or authorization of the Director of the Department.

An introductory communication course with emphasis on interpersonal conversation in business and professional settings.

INGL 3197. PROFESSIONAL PRESENTATIONS. One credit hour. One hour of lecture per week. Prerequisites: INGL 3012 or INGL 3212 or INGL 3202 or authorization of the Director of the Department.

An introductory course with emphasis on developing skills for presentations in business and professional settings.

INGL 3198. PROFESSIONAL INTERVIEWS. One credit hour. One hour of lecture per week. Prerequisites: INGL 3012 or INGL 3212 or INGL 3202 or authorization of the Director of the Department.

An introductory communication course with emphasis on developing job interviews skills in business and professional settings.

INGL 3201. ENGLISH COMPOSITION AND READING. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: INGL 3102.

Practice in writing compositions and making oral reports upon selected readings, including essays, short stories, poems, dramas and novels. Attention will be given as needed to grammar and idiomatic expressions. This course or its equivalent is a requisite for graduation.

INGL 3202. ENGLISH COMPOSITION AND READING. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: INGL 3201.

Practice in writing compositions and making oral reports upon selected readings, including essays, short stories, poems, dramas and novels. Attention will be given as needed to grammar and idiomatic expressions. This course or its equivalent is a requisite for graduation.

INGL 3205. GRAMMAR AND USAGE OF ENGLISH. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerequisites: INGL 3202 or INGL 3191 or INGL 3209 or INGL 3104 or INGL 3212 or INGL 3289.

Strengthening of knowledge and skills of non-native speakers of English in English grammar and usage. Intensive practice of question and negative formation, placement of frequency adverbs, verb tenses, modals, gerund and infinitive phrases, prepositions and punctuation as it relates to grammatical structure.

INGL 3209. COMMUNICATION IN SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3201.

Theory and practice of effective oral and written communication in the sciences using English as a second language. Discussion of formulation of hypothesis, avoiding plagiarism, appropriate use of reliable references, summarizing scientific articles, writing research reports, and preparing oral and poster presentations, among other topics.

INGL 3211. ADVANCED ENGLISH I. Three credit hours. Three hours of lecture per week. Prerequisite: placement by College Board Achievement Exam.

Development of reading, discussion, and writing skills through the experience, interpretation, and evaluation of short story, modern drama, poetry, and the essay. Introduction to library skills related to literary study.

INGL 3212. ADVANCED ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3211.

Development of reading, discussion, and writing skills through the experience, interpretation, and evaluation of the novel, Shakespearean drama, and the complex texture of poetry. A research paper related to literary study will be required.

INGL 3225. INTRODUCTION TO LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

An introductory survey of linguistics with special attention to the English language, emphasizing phonology, morphology, syntax, semantics, historical change, and social and regional variations.

INGL 3227. PHONETICS OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Articulation, rhythm, and intonation of English, including its phonetic description, transcription, and oral practice in the laboratory.

INGL 3231. ENGLISH EXPOSITORY WRITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Practice in the various forms of expository writing. Detailed class criticism of diction, phrasing, and sentence structure. A research paper will be required.

INGL 3236. TECHNICAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

The planning, writing, and production of formal technical reports, memos, letters, and other short technical documents commonly written by professionals in a wide variety of workplace settings.

INGL 3238. CREATIVE WRITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Theory and practice in the writing of fiction, poetry, and drama. Detailed class criticism of students works.

INGL 3250. **PUBLIC SPEAKING.** Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Principles and practice of oral presentations, their preparation, composition, and delivery, including formal, informal, and impromptu speech.

INGL 3268. WRITING FOR THE MEDIA. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Theory and practice in writing to broadcast information to an audience through the communications media.

INGL 3276. INTRODUCTION TO LITERATURE: SHORT STORY. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Introduction to the literary elements, and analysis of the movements and key writers of short fiction in english.

INGL 3277. INTRODUCTION TO LITERATURE: THE NOVEL. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Introduction to the literary elements and analysis of the novel. Critical reading, writing, and thinking approaches. Discussion of the fictional techniques and literary contexts exemplified in novels. Literary analysis and interpretation using critical theory techniques.

INGL 3278. INTRODUCTION TO DRAMA. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212.

Discussion and analysis of elements, forms, conventions, techniques, and literary contexts exemplified in dramatic literature.

INGL 3279. INTRODUCTION TO POETRY. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212.

Formal and historical analysis of poetry. Discussion of the elements, modes, techniques, and literary contexts exemplified in poetic literature.

INGL 3280. READING WRITING SCREENPLAY. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerrequisites: INGL 3104 or INGL 3212 or INGL 3202.

Study of the screenplay as text; writing of critical essays and screenplays from original materials or adaptations from other authors.

INGL 3286. CREATIVE WRITING FICTION. Three credit hours. One hour of lecture and two hours of discussion per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Intensive individual work and group discussion of techniques of fiction writing.

INGL 3289. CONVERSATIONAL ENGLISH**.** Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3201 or authorization of the Director of the Department.

Skills in English in academic, professional, and social settings to increase fluency and confidence as well as to improve pronunciation and listening comprehension.

INGL 3295. PRINCIPLES OF SPEECH COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3201- English Composition and Reading.

Recognition of the basic principles of speech communication to increase knowledge and ability in communicating effectively at the professional and social levels. Explanation of topics such as nonverbal communication, diction, organization of speech, and small group communication.

INGL 3296. WORLD ENGLISHES. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Linguistic evolution of the english language as a result of contact with english-speaking nations and its emergence in local social, historical, cultural, and political contexts around the world. Emphasis on english as an international, second and foreign language in different types of english using societies. Includes case studies from the Caribbean and Puerto Rico contexts.

INGL 3300. SPECIAL TOPICS IN ENGLISH STUDIES. One to six credit hours. One to six hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3012.

Study of a special topic directed by an instructor specialized in the particular field of study of the course.

INGL 3305. MODERN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Major american writers of the present century with particular attention to the development of prose fiction and modern cultural attitudes.

INGL 3306. MODERN BRITISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Major british writers of the present century with particular attention to the development of prose fiction and modern cultural attitudes.

INGL 3307. INTRODUCTION TO COMMUNICATION IN THE WORKPLACE. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerequisites: INGL 3202 or INGL 3289 or INGL 3209 or INGL 3104 or INGL 3212.

Application of the fundamentals of business writing and oral communication in professional contexts to help intermediate-level students build on their English language communication skills in different workplace situations. Emphasis on reading, writing and responding in different types of professional interactions.

INGL 3308. INTRODUCTION TO LITERARY THEORY FROM 1900 TO THE PRESENT. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3351 or INGL 3352 or INGL 3321 or INGL 3322.

Application of different theoretical approaches to literature in English. Introduction to the study of the major schools of literary theory since 1900 such as New Criticism, psychoanalysis, structuralism, deconstruction, Marxism, feminism and gender studies, new historicism, postcolonial theory, cultural Studies, reception theory, posthumanism and eco-criticism.

INGL 3310. THE GOTHIC NOVEL FROM WALPOLE TO SHELLEY. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212.

A study of the themes that characterize the major writers of the Gothic novel in the long 18th century (1688-1832) from its beginnings in Horace Walpole's Castle of Otranto to Mary Shelley's Frankenstein, emphasizing writers such

as Clara Reeve, William Beckford, Sophia Lee, Mathew Lewis, Ann Radcliffe, William Godwin, Charlotte Dacre, Charles Maturin, John Polidori and Mary Shelley.

INGL 3312. THE NOVEL IN ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Discussion of the works of the major english novelists from the eighteenth century to the present.

INGL 3317. THE NOVEL IN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Discussion of the major american novelists of the nineteenth and twentieth centuries.

INGL 3318. LITERATURE OF THE ENGLISH SPEAKING CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Caribbean novelists, short story writers, poets, and playwrights of the 20th century who write in english.

INGL 3321. ENGLISH LITERATURE TO 1798. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Representative authors and major movements from the beginnings of english literature to the end of the neoclassical period.

INGL 3322. ENGLISH LITERATURE FROM 1798 TO MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Representative authors and major movements in english literature from the beginnings of the romantic period to the modern era.

INGL 3323. MODERN DRAMA IN ENGLISH SINCE 1890. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

A survey of modern drama in England, Ireland, and the United States including such figures as Wilde, Shaw, O'casey, O'neill, Miller, Albee, and Pinter.

INGL 3325. MODERN POETRY. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Lectures on the beginning of modern poetry, the imagist movement, and the chief lines of develeopment throughout the thirties and forties to the contemporary period. Special attention will be given to the major work of William Butler Yeats, Robert Frost, Wallace Stevens, William Carlos Williams, Ezra Pound, T.S. Eliot, and Dylan Thomas.

INGL 3326. LITERATURE OF MINORITY IN THE UNITED STATES. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

English-language literature of minorities in the United States, with particular attention to african american, asian american, native american, and latino works.

INGL 3345. TOPICS IN CINEMA. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Introduction to english language cinema in the context of linguistic and literary analysis: history, theory, selected genres, cinematic analysis and criticism, aesthetic response, and semiotics.

INGL 3351. AMERICAN LITERATURE TO 1860. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Major works of the literature of the United States from the colonial period to the onset of the civil war.

INGL 3352. AMERICAN LITERATURE FROM 1860 TO THE EARLY MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212 or INGL 3209 or INGL 3289.

Major works of the literature of the United States from the civil war up to the early modern period.

INGL 4000. ENGLISH LITERATURE OF THE 17TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Major poetic and intellectual traditions in the seventeenth century as represented in the works of Donne, Johnson, Herbert, Marvell, and others, with special emphasis given to the work of John Milton.

INGL 4008. CREATIVE NON-FICTION WRITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3231 and INGL 3238 or authorization of the Director of the Department.

Development of creative non-fiction writing using elements and genres of fiction such as plays, poetry, memoirs, plot, characterization and dialogue. Reading and writing of texts in non-fiction genres. Preparation of a manuscript for publication and submission of a portfolio will be required.

INGL 4009. LITERATURE OF THE ENGLISH RENAISSANCE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Exploration of the major literary traditions and figures of the English Renaissance including More, Wyatt, Surrey, Spencer, Sidney, Marlowe, and Shakespeare.

INGL 4017. THE ROMANTIC MOVEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

A study of the works of the principal poets of the Romantic Movement, with reading and interpretation of the chief poems of Wordsworth, Coleridge, Byron, Shelly, and Keats.

INGL 4025. SHAKESPEARE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Shakespeare's dramatic craftsmanship, poetry, humor characterization, psychology, and modern pertinence, as illustrated in representative tragedies, comedies, and history plays.

INGL 4026. SOCIOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or authorization of the Director of the Department.

Language as a means of social interaction; linguistic variations and their relation to sociological, economic geographic, and cultural factors with reference to bilingual areas such as Puerto Rico.

INGL 4027. OLD AND MIDDLE ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Development of English literature from Anglo-Saxon times through the medieval period with special emphasis given to the work of Chaucer.

INGL 4028. RESEARCH AND WRITING IN LANGUAGE AND LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3231 and six credit hours in linguistics.

A course in the methods of research, including the use of bibliographies and other reference works. Students will do individual work based upon assigned topics in language and linguistics, and will prepare a paper to be read and defended before the class.

INGL 4030. RESEARCH AND WRITING IN LITERATURE. Three credit hours. Three hours of seminar per week. Prerequisites: INGL 3231 and six credit hours in English Literature.

A course in the methods of research, including the use of bibliographies and other reference works. Students will do individual work based upon assigned topics in literature and will prepare papers to be read and defended in class.

INGL 4045. LITERATURE OF THE ENGLISH-SPEAKING CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3012 or INGL 3212 or six credits in English 3000-level.

Caribbean novelists, short story writers, poets, and play-writers of the 20th century who write in English.

INGL 4047. ENGLISH PHONOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (INGL 3225 and INGL 3227) or authorization of the Director of the Department.

An examination of the systematic use of sounds in English and other languages; methods and techniques of analysis; theory and history of phonology.

INGL 4059. PERSUASIVE WRITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3231 and INGL 3268 or authorization of the Director of the Department.

Understanding, analysis and preparation of persuasive texts for publication in diverse media. Analysis of arguments using Toulmin and other models is emphasized. Final project required.

INGL 4066. RESEARCH IN WRITING AND COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3231 and six credits among (INGL 3236, INGL 3238, INGL 3268, INGL 4107, and INGL 4108).

Study of the methods of research in writing and communication. Use of databases, bibliographies, and other library resources, with emphasis on citation, documentation, and intellectual honesty. Application of qualitative and quantitative methodologies to conduct research projects on writing and communication. Presentation and defense of a written paper.

INGL 4075. PSYCHOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or authorization of the Director of the Department.

Psychology and language learning; analysis of the process of first and second language acquisition; introduction to research and theory of language acquisition, and its application to the teaching of English as a second language.

INGL 4095. THE VICTORIAN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33—or higher, or authorization of the Director of the Department.

The major works of the Victorian period in poetry, criticism, and thought, with particular attention to cultural interchange with the European continent.

INGL 4097. ENGLISH LITERATURE OF THE 18TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Literature of the Restoration and eighteenth century with emphasis given to the work of Dryden, Swift, Pope, and Samuel Johnson.

INGL 4107. RHETORICAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3231 or authorization of the Director of the Department.

The interrelation of classical and modern rhetorical theory including the nature of persuasion, the rhetorical situation, and the structure of discourse.

INGL 4108. ADVANCED TECHNICAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3236 or authorization of the Director of the Department.

Principles and practice of writing and presenting technical communications.

INGL 4125. INTRODUCTION TO SEMANTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or authorization of the Director of the Department.

The semantics of English from the perspective of linguistics: relation of syntactic form to meaning, the analysis of presupposition, word meaning, strategies for establishing meaning in the context of discourse, and semantic universals.

INGL 4196. GROUP COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3056.

Analysis of communication theories and research in order to develop group communication skills in a professional setting. Planning, implementation and evaluation of group communication using oral, written, and visual forms of communication. Development of communication skills that address workplace conflict, problem solving, and design of successful group communication strategies. Discussion of basic intercultural communication concepts. Analysis of non-verbal communication within a professional group.

INGL 4205. MORPHOLOGY AND SYNTAX. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225.

Theory of language structure, primarily from the viewpoint of transformational-generative grammar.

INGL 4206. THE STRUCTURE OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or authorization of the Director of the Department.

Advanced grammar course, especially in syntax.

INGL 4208. HISTORY OF THE ENGLISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or authorization of the Department Director.

The English language from its Anglo-Saxon origins to modern times.

INGL 4255. PROFESSIONAL EDITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 4008 or INGL 3231 and (INGL 3236 or INGL 3238 or INGL 3268).

Study of the editorial process from initial contact by the author to the production of the final manuscript. Acquisition of foundations in professional editorial practices in diverse editorial positions. Analysis of editorial projects including

fiction, nonfiction, literary works, trade publications, mass markets paperbacks, reference books, self-help books and other genres.

INGL 4285. FEATURE WRITING. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3268 and INGL 4008 or authorization of the Director of the Department.

A journalism course that builds on news writing and focuses on the theory and practice of writing feature articles for newspapers, magazines, and electronic publications. Generation and development of ideas for feature stories targeted to specific audiences. Application of grammatical rules and the principles of organization accuracy, conciseness, and clarity in writing. Development of skills required to submit feature articles for publication and conduct peer critiques. A final portfolio will be required.

INGL 4316. AMERICAN ROMANTICISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Exploration of the literary traditions of the Romantic Period in the United States through a study of its major authors: Emerson, Hawthorne, Poe, Thoreau, Melville, and Whitman.

INGL 4317. AMERICAN REALISM AND NATURALISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or authorization of the Director of the Department.

Development of fictional techniques in the United States during the late nineteenth and early twentieth centuries with readings from the following authors: Mark Twain, Howells, James, Garland, Norris, Crane and Dreiser.

INGL 4318. EARLY AMERICAN AUTHORS. Three credit hours. Three hours of lecture per week. Prerequisite: one 3000 level course in literature.

The growth of an American tradition and consciousness in selected prose and poetry from the puritan period, the age of reason, and the pre-romantic movement in the literature of the United States.

INGL 4998. SUPERVISED RESEARCH IN ENGLISH. Three credit hours. Half hour of lecture, half hour of discussion and eight hours of research per week. Prerequisite: authorization of the Director of the Department.

Research in English supervised by a faculty member in the English Department.

Advanced Undergraduate and Graduate Courses

INGL 5007. ORAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Communication theory and speaking techniques, including enunciation, intonation, phrasing, projecting the voice, and holding audience attention. Varieties of formal oral interpretation are studied and practiced, including drama and poetry reading, public speaking, and debate.

INGL 5009. CONTRASTIVE GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Analysis of the descriptive grammars of English and Spanish to identify areas of divergences and to achieve an understanding of linguistic universals.

INGL 5010. PERSPECTIVES OF TEACHING ENGLISH AS A SECOND LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department. Co-requisite: EDPE 4245 or authorization of the Director of the Department.

Historical overview of language teaching methods from grammar-translation to the most recent approaches; students will develop applications for teaching English as a second language.

INGL 5015. ENGLISH AND AMERICAN LITERARY CRITICISM. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Theory and practice of literary criticism within the tradition of English and American literature. A research paper will be required.

INGL 5018. STUDY IN THE BRITISH ISLES. Three credit hours. Twenty two point five (22.5) hours of lecture and twenty five hours of seminar per summer. Prerequisite: authorization of the Director of the Department.

Selected courses on various topics in English literature and culture, offered by international summer school programs in universities in the British Isles, such as the university of Cambridge, Oxford University, or University of Edinburgh. Includes plenary lectures on special topics in English literature and excursions to sites of historical and cultural interest.

INGL 5025. CURRENT APPROACHES IN LINGUISTIC THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Recent developments in linguistic theory and their application to related issues.

DEPARTMENT OF GEOLOGY

Undergraduate Courses

GEOL 3025. EARTH SCIENCES. Three credit hours. Three hours of lecture per week. Co-requisite: GEOL 3047 (Only for Geology students).

Introduction to the study of the earth. The structure, composition, and tectonics of the lithosphere; the interaction of the hydrosphere and atmosphere with the lithosphere, the earth in relation to the solar system. Field trips are required.

GEOL 3026. LIFE IN THE PAST. Three credit hours. Three hours of lecture per week.

Introduction to the evolution and the ecological significance of life in the course of geological time. Field trips are required.

GEOL 3027. GEOLOGICAL ASPECTS OF THE ENVIRONMENTAL SCIENCES. Three credit hours. Three hours of lecture per week.

Human activities that degrade the earth and those terrestrial phenomena actually or potentially harmful to man.

GEOL 3028. INTRODUCTION TO EARTHQUAKES. Three credit hours. Three hours of lecture per week.

Description of earthquakes, from the conditions that cause them to their geographic distribution in relation to global plate tectonics. Identification of instrumentation and description of modern methods employed to determine earthquake locations and the parameters used to make estimates of seismic rupture process. Exploration of earthquake mitigation, secondary effects, and social impact and resilience.

GEOL 3045. PLANETARY GEOLOGY. Three credit hours. Three hours of lecture per week.

Introduction to earth and planetary sciences through the study of the composition, structure, and dynamic processes of the earth and other planets.

GEOL 3047. INTRODUCTORY GEOLOGY LABORATORY. One credit hour. One three-hour laboratory per week. Co-requisite: GEOL 3025.

Introduction to the use and interpretation of topographic and geologic maps, and aerial photographs; identification of common minerals, rocks, and fossils; interpretation of geologic structures. Field trips required.

GEOL 3055. MORPHOLOGICAL CRYSTALLOGRAPHY AND CRYSTAL CHEMISTRY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: (MATE 3171 or MATE 3005) and (QUIM 3131 and QUIM 3133). Co-requisite: GEOL 3025.

Internal structure and morphological characteristics of the thirty two (32) different classes of crystals. Basic crystal structures of rock-forming minerals and crystal chemistry.

GEOL 3056. GEOCHEMISTRY OF MINERAL SYSTEMS AND OPTICAL MINERALOGY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: GEOL 3055.

Occurrence, geochemistry, and physical properties of rock-forming and economic minerals. Macroscopic and microscopic identification of minerals.

GEOL 3067. VOLCANOES. Three credit hours. Three hours of lecture per week.

Volcanoes, their products, and their effects on the environment and human beings.

GEOL 3070. INTRODUCTION TO MARINE GEOLOGY. Three credit hours. Three hours of lecture per week.

Introduction to the morphology, structure, stratigraphy, and evolution of ocean basins and adjacent continental margins. Presentation of concepts of paleoceanography, including the paleoclimatic record in ocean sediments and measuring changes in sea level. Discussion of the objectives and limitations of research in marine oceanography. Study of the development of ocean basins based on the concept of plate tectonics; the rocks, minerals, and sediments that compose the ocean floor; and the environmental problems and management strategies associated with the marine setting.

GEOL 3105. IMAGES OF PLANET EARTH. Three credit hours. Three hours of lecture per week.

The use of images of our planet Earth for the study of earth systems science with emphasis on global change; the interactions among the lithosphere, asthenosphere, hydrosphere, cryosphere, atmosphere, and biosphere; the Earth as a planet within the solar system.

GEOL 4001. TOPICS IN GEOLOGY. One to three credit hours. One to three hours of lecture per week. Prerequisite: Senior standing in Geology.

Special topics in geology based on review of literature, and on field and/or laboratory experiences.

GEOL 4002. TOPICS IN GEOLOGY. One to three credit hours. One to three hours of lecture per week. Prerequisite: Senior standing in Geology.

Special topics in geology based on review of literature, and on field and/or laboratory experiences.

GEOL 4005. ELEMENTARY PALEONTOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 3026.

Principles of stratigraphical paleontology; invertebrate, vertebrate and plant fossils; practical applications. Representative examples of each group will be studied in the laboratory.

GEOL 4006. ELEMENTARY STRUCTURAL GEOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 3025.

The study of major and minor rock structures. The general structure of the Earth, and deformation of its crust. Practical interpretation of geological maps.

GEOL 4009. STRATIGRAPHY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4046.

Survey of fundamental stratigraphic principles applicable to the analysis and interpretation of stratified rocks, their contained fossils, and their relations in space and time. Systematic account of the stratigraphic systems in selected regions, and interpretation of their broader relations in the Earth's crust.

GEOL 4011. SEMINAR IN GEOLOGY. One credit hour. One hour of seminar per week. Prerequisite: Senior standing in Geology.

Class presentation and discussion of selected topics in geology.

GEOL 4012. SEMINAR IN GEOLOGY. One credit hour. One hour of seminar per week. Prerequisite: GEOL 4011 and GEOL 4045 and GEOL 4046.

Class presentation and discussion of selected topics in geology.

GEOL 4015. GEOLOGY FOR ENGINEERS. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

General principles of geology, with special emphasis on those aspects pertaining to engineering problems; study of common minerals and rocks; structural geology and geomorphology.

GEOL 4016. ENGINEERING GEOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4006 or GEOL 4015.

Study of the specific application of geological principles to engineering problems, such as foundations, road location, water supply, dam and reservoir sites, construction materials, and beach erosion.

GEOL 4017. ELEMENTARY GEOMORPHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (GEOL 3025 and GEOL 3047) or (GEOL 4015 or INCI 4001) or authorization of the Director of the Department.

Study of the development of landforms; interpretation of topography and topographic maps.

GEOL 4018. FIELD GEOLOGY. Six credit hours. Six weeks in field camp during the summer. Prerequisite: GEOL 4009 and GEOL 4045.

Introduction to geological field methods; preparation of geological maps using plane table, pace-and-compass and other techniques; construction of structural cross sections.

GEOL 4019. ECONOMIC GEOLOGY. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: GEOL 4045.

The nature, occurrence, origin, and host rocks of commercially important mineral deposits. Identification, classification, and textural analysis of ore minerals. Field trips are required.

GEOL 4029. FIELD METHODS IN GEOLOGY. Three credit hours. Two hours of discussion and lecture and three hours of laboratory per week. Prerequisite: authorization of the Director of the Department.

Principles of topographic and geologic mapping using a variety of instruments. Discussion and application of new technologies, measurement techniques and their advantage in developing topographic and geologic maps.

GEOL 4037. VOLCANOES AND THEIR HAZARDS. Three credit hours. Three hours of lecture per week. Co-requisite: GEOL 4017.

Hazards associated with volcanic activity; monitoring of volcanoes, and long and short term forecasting of eruptions; effects of volcanic eruptions on humans, infrastructure, and agriculture; impact of volcanic crises on society; analysis of case studies.

GEOL 4045. PETROGENESIS OF CRYSTALLINE ROCKS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3056.

The study of igneous and metamorphic rocks, emphasizing field identification. Introduction to microscopic petrography of common rocks.

GEOL 4046. SEDIMENTARY ENVIRONMENTS AND LITHOGENESIS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3056.

Introduction to the processes of sedimentary rock formation, including the weathering of rocks and the transportation, deposition, and lithification of sediments. Emphasis on the field study of diverse modern sedimentary environments and classification of sedimentary rocks based on petrographic analysis.

GEOL 4047. INTRODUCTION TO GEOCHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM3002 and GEOL4045 and GEOL4046) or (QUIM3132 and QUIM3134 and GEOL4045 and GEOL4046).

Chemical principles applied to geological processes. Topics include: thermodynamic properties of geological materials; gaseous and ionic behavior in acqueous media under dynamic and equilibrium environmental conditions; geochemical methods to study changes in the earth's surface.

GEOL 4048. GEOLOGICAL APPLICATIONS OF REMOTE SENSING. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: (MATE 3031 and FISI 3151) or authorization of the Director of the Department.

Theory and techniques of remote sensing applied to the geosciences, including interpretation of images of the surface of the earth and other planets.

GEOL 4049. UNDERGRADUATE RESEARCH I. Two credit hours. Six hours of practice and/or laboratory per week. Prerequisite: (GEOL 4045 and GEOL 4046) or authorization of the Director of the Department.

Research in geology, supervised by a faculty member.

GEOL 4055. UNDERGRADUATE RESEARCH II. Two credit hours. Six hours of practice and/or laboratory per week. Prerequisite: GEOL 4049.

Research in geology, supervised by a faculty member.

GEOL 4057. ENVIRONMENTAL GEOPHYSICS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisites: (GEOL 3025 or GEOL 4015) and (FISI 3151 or FISI 3161 or FISI 3171).

The application of geophysical methods such as: seismic reflection/refraction, gravity, electrical, magnetic ground penetrating radar especially to environmental problems in Puerto Rico. Field trips are required.

GEOL 4058. INTERIOR OF THE EARTH. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 3151-Modern College Physics I or FISI 3171-Physics I) and GEOL 3025-Earth Sciences and QUIM 3132-General Chemistry II.

Examination of the dynamic forces taking place within the Earth's interior since its creation to the present and interpret their effects on the planet's surface. Illustration of the Earth's interior physical laws emphasizing the Earth's structure according to geophysical and geochemical obserations. Study of recent findings from laboratory and modeling experiments performed on rocks and minerals, numerical modeling and equations of state as applied to the Earth.

GEOL 4059. PHYSICAL VOLCANOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 4045.

Physical volcanology including properties of magmas, subaerial and submarine volcanic processes, effusive and explosive products, volcanic edifices, effects of volcanism on climate, and extraterrestrial volcanism. Analysis of case studies. Field trips required.

GEOL 4060. GEOLOGICAL APPLICATIONS OF CARTOGRAPHY AND GEODESY. Three credit hours. Two hours of conference and one three-hour laboratory per week.

Techniques of cartography and geodesy in map- making and surveying for the geosciences with an emphasis on EDM, laser-ranging, geodetic GPS surveying, and the generation of hypsometric data from airborne and satellite platforms. Examples of environmental, geological and natural hazard mitigation applications from the Caribbean.

GEOL 4105. INTRODUCTION TO HYDROGEOLOGY. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: GEOL 3047 and GEOL 4017.

Discussion of the effects of precipitation, evapotranspiration, and runoff in the Hydrologic Cycle, and their interaction with surface landforms and geologic strata. Study of flooding, groundwater, and hydrochemistry and water quality, particularly in Puerto Rico. Field trips required.

Advanced Undergraduate and Graduate Courses

GEOL 5005. MARINE GEOLOGY. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: GEOL 4046 or authorization of the Director of the Department.

Discussion of the broad morphotectonic features of the sea floor and of coastal zones. Sediments, their origin, mode of formation, methods of study and interpretation. Reefs. Sea bottom topography and geomorphology. Study of changes of the level of the sea. Emphasis on the Caribbean region.

GEOL 5006. SEDIMENTATION. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4046 or authorization of the Director of the Department.

Erosion, transportation, and deposition of sediments; classification of sediments; sedimentary environment; sedimentary history of depositional sites; significance of grain size in the sedimentary environment.

GEOL 5008. MICROPALEONTOLOGY. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: GEOL 4003 or authorization of the Director of the Department.

Foraminifers, structure and morphology of the test, stratifraphy and paleoecology, fundamentals of classification, tintinnids, radiolarians, conodonts, ostracods, dicoasterids.

GEOL 5011. PRINCIPLES OF PALEONTOLOGY I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Morphology and classification of fossils with emphasis on the invertebrates. General stratigraphic distribution. The most significant fossil groups will be studied in the laboratory.

GEOL 5015. OPTICAL MINERALOGY. Three credit hours. Two hours of lecture and one three hour laboratory per week. Prerequisite: GEOL 3056 or authorization of the Director of the Department.

Optical crystallography, detailed microscopic study of rock forming minerals.

GEOL 5020. ADVANCED GEOPHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: GEOL 4057 or authorization of the Director of the Department.

The principal physical processes related to the dynamics and evolution of the earth, including energetic activity, gravitational and magnetic fields, heat flow, tectonics, and convection.

GEOL 5025. GEOLOGY OF THE CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: GEOL 4009 or authorization of the Director of the Department.

The geological and geophysical history and evolution of the Caribbean region, with special emphasis on Puerto Rico; mineral resources; geological hazards; relation of the region to global tectonics.

GEOL 5026. TECTONICS. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Theory of global plate tectonics as a synthesis of diverse geological themes, with emphasis on the Caribbean region.

GEOL 5027. METALLOGENESIS AND GLOBAL TECTONICS. Three credit hours. Three hours of lecture per week.

The relationship of the genesis and distribution of ore deposits to the tectonic environments.

GEOL 5565. EARTHQUAKE SEISMOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (GEOL 4057 and MATE 3032 and FISI 3152) or authorization of the Director of the Department.

The use of local and global networks to determine the location, magnitude, and source parameters of earthquakes; global seismicity; theory of wave propagation; point sources; inversion of the Earth's structure; source properties.

GEOL 5575. SEISMOTECTONICS. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Description of the relationship between seismology and plate tectonics. Recognize how earthquakes are used to identify the forces that act along active plate boundaries. Catalog earthquake types occurring at convergent, divergent and shear plate boundaries. Apply the concepts of Physics to explain the seismic processes occurring on the fault plane. Distinguish between slow-slip and stick-slip fault movements. Relate the signal obtained from modern seismic and geodetic instruments with seismic processes to infer plate boundary kinematics.

GEOL 5605. GEOLOGICAL HAZARDS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: GEOL 3025 or GEOL 4015 or authorization of the Director of the Department.

Mechanisms, distribution, and mitigation of geological hazards, including earthquakes, surface fault ruptures, volcanoes, landslides, floods, and ground subsidence. Analysis of case histories. Field trips are required.

GEOL 5985. SPECIAL TOPICS IN PALEONTOLOGY. One to three credit hours. Prerequisite: authorization of the Director of the Department.

Recent developments in paleontologic principles. Field trips required.

GEOL 5993. ADVANCED GEOCHEMISTRY. One to three credit hours. One to three hours of lecture per week.

Advanced topics in geochemistry. Field trips required.

GEOL 5994. SPECIAL TOPICS IN PALEONTOLOGY WITH LABORATORY. One to three credit hours. Prerequisite: authorization of the Director of the Department.

Special topics in paleontology. Field trips required.

GEOL 5998. ADVANCED PETROLOGY I. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Advanced topics on the origin of volcanic, plutonic, and metamorphic rocks. Course content will vary depending on the interests of the professor and students. Field trips required.

DEPARTMENT OF HISPANIC STUDIES

Undergraduate Courses

ESPA 0041. SPANISH FOR BEGINNNERS. No credit. Three hours of lecture per week.

A practical course in conversation for students whose native language is not Spanish, including the basic elements of the language, and the acquisition of a working vocabulary.

ESPA 0042. SPANISH FOR BEGINNNERS. No credit. Three hours of lecture per week.

A practical course in conversation for students whose native language is not Spanish, including the basic elements of the language, and the acquisition of a working vocabulary.

ESPA 3021. MASTERPIECES OF LATIN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of masterpieces of Spanish American Literature from the sixteenth century to the nineteenth century, including examples of Puerto Rican literature.

ESPA 3022. MASTERPIECES OF LATIN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of some of the outstanding works of Spanish American literature from the nineteenth century to the present, including examples of Puerto Rican literature.

ESPA 3101. BASIC COURSE IN SPANISH I. Three credit hours. Three hours of lecture per week.

Practice in the critical reading of literary texts, the writing and editing of narrative texts; effective oral communication in Spanish.

ESPA 3102. BASIC COURSE IN SPANISH II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3101.

Practice in the critical reading of essays, poetry, and drama; the writing and editing of expository texts; effective oral communication in Spanish.

ESPA 3126. LATIN AMERICAN CINEMA. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study and critical analysis of the most relevant film movements in Latin America, both in documentary and fiction cinema. Evaluation of the aesthetic aspects of cinematographical creation unique to each country within the Latin American context.

ESPA 3127. INTRODUCTION TO CENTRAL AMERICAN LITERATURE**.** Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Reading and analysis of representative Central American literary works belonging to key periods in the region, from a literary, sociological, cultural, and historical perspective.

ESPA 3131. ACADEMIC LITERACY I. Three credit hours. One hour of lecture, one hour of discussion and one hour of workshop per week.

Study and practice of communication strategies, media literacy, and reading comprehension through the different discursive modes as well as textual and multimodal genres. Identification and application of various types and levels of reading. Development of techniques for the written production and comprehension of academic texts, with an emphasis on narrative-descriptive texts. Acquisition and practice of oral comprehension and production skills within academic and professional environments.

ESPA 3132. ACADEMIC LITERACY II. Three credit hours. One hour of lecture, one hour of discussion and one hour of workshop per week. Prerequisite: ESPA 3131.

Study and practice of communication strategies, media literacy, and reading comprehension through the different discursive modes as well as textual and multimodal genres. Identification and application of various types and levels of reading. Development of techniques for the written production and comprehension of academic texts, with an emphasis on expository-argumentative texts. Acquisition and practice of oral comprehension and production skills within academic and professional environments.

ESPA 3170. JOURNALISTIC WRITING. Three credit hours. Three hours of lecture and workshop per week. Prerequisite: ESPA 3102- Basic Course in Spanish II.

Application of the basic concepts of journalism and the writing styles and structures of different journalistic genres. Emphasis on writing specialized news, features, and editorials for the printed and digital media.

ESPA 3175. READING "RACE" IN PUERTO RICO. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Discussion of the attitudes and representations regarding Black heritage by the academic and popular sectors of Puerto Rico throughout the reading of various texts. Exploration of the function of language as a medium that constructs and reflects racial and racist attitudes. Analysis of the diverse strategies of resistance, identification, and appropriation demonstrated by sectors of the black "race" in the discursive manifestations studied in class.

ESPA 3211. INTRODUCTION TO SPANISH LITERATURE I. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

A study of literary movements, authors and representative works of spanish literature from the Middle Ages to the Renaissance.

ESPA 3212. INTRODUCTION TO SPANISH LITERATURE II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Literature from the middle ages to the renaissance in the first semester, and from the goldenage to the present.

ESPA 3215. COMMERCIAL EXPRESSION AND COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102 and students of Business Administration College.

Development of skills for efficient language use, both oral and written. Special attention will be given to written communication forms: letters, memoranda, summaries, reports, etc. The principles of logic and psychology basic to the efficient writing of these forms will be presented and intense practice in their preparation will be given.

ESPA 3216. FORMAL EXPOSITIVE WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Writing of expositive formal texts through a planned process, with emphasis in argumentative exposition. Application of principles of theories of writing, natural languages, and academic literacy. Practice of the writing process by means of exercises, reading of model texts, and activities oriented towards the acquisition of new vocabulary.

ESPA 3295. SPANISH GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Approach to Spanish grammar as a theoretical-practical study of the linguistic competence. Description of the phonetic, phonological, morphological and syntactical components. Analysis of gramatical structures in contemporary Spanish.

ESPA 3305. CINEMA AND HISPANIC LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A comparative analysis of literary and cinematic codes in Hispanic texts and the films based on them.

ESPA 3315. WOMEN AND WRITING IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Identity, intimacy, and social struggle of Hispanic American women in representative texts written by women; diverse readings from a gender perspective.

ESPA 3405. FEMININE DISCOURSE IN ART OF THE HISPANIC WORLD. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Reading and analysis of the 20th and 21st century Hispanic literary, artisan, pictorial, musical, and film texts dealing with the female figure as subject-creator. Interpretation of cultural texts applying discursive theoretical models. Particular attention is given to the marked divergence of the genders in artistic representations by problematizing the female subject-creator.

ESPA 3406. CREATIVE WRITING: SHORT STORIES. Three credit hours. One hour of lecture and two hours of workshop per week. Prerequisite: ESPA 3102.

Theory and practice of the short story. Discussion of theoretical aspects of the narrative. Analysis of model texts. Practice of the processes, and use of resources in the context of short stories. Revision and discussion of narrative exercises through conferences and workshops. Writing of original short stories is required.

ESPA 3505. WOMEN AND FOLKLORE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of folkloristic from the perspective of women. Analytic discussion concerning folkloric manifestations by and about women using cultural texts. Research and compilation of folkloric materials produced by women in Puerto Rico.

ESPA 3906. BIBLIOGRAPHICAL RESEARCH IN HISPANIC STUDIES. Two credit hours. Two hours of lecture and one hour of research per week. Prerequisite: ESPA 3102.

Introduction to the use of library resources and bibliographical sources related to research in Hispanic literature and linguistics. Identification, compilation, and search of bibliographic documentation in catalogs, indexes, databases, and other references. Preparation of a bibliography on a specific topic is required.

ESPA 4007. FICTION IN PUERTO RICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

History and appreciation of the novel and short story in the literature of Puerto Rico from the 19th Century to the present. Text analysis, reports and lectures.

ESPA 4011. DIACHRONY OF THE SPANISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: (ESPA 4201 and ESPA 4202) or INGL 3225.

Phonological, morpho-syntactic and lexico-semantic evolution of the Spanish language from Latin.

ESPA 4012. THE SPANISH LANGUAGE IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: (ESPA 4201 and ESPA 4202) or INGL 3225.

Analysis of Hispanic American Spanish from the perspectives of linguistic geography, dialectology, and sociolinguistics.

ESPA 4021. CERVANTES. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

Lectures on the works of Cervantes accompanied by critical analysis. Study of this writer's poetry, "entremeses", novels, with special emphasis on the Novelas Ejemplares and Don Quijote, and consideration of the importance and significance of these writings in the field of Hispanic letters.

ESPA 4022. CERVANTES. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 4021.

Lectures on the works of Cervantes accompanied by critical analysis. Study of this writer's poetry, "entremeses", novels, with special emphasis on the Novelas Ejemplares and Don Quijote, and consideration of the importance and significance of these writings in the field of Hispanic letters.

ESPA 4036. LANGUAGE, LITERATURE AND THE ENVIRONMENT. Three credit hours. Three contact hours per week. Prerequisite: ESPA 3102.

This course will analyze environmental issues within a multidisciplinary approach while highlighting the study of Spanish and its literatures. The course emphasizes the analysis of environmental problems and how important is the study of language and literature are ways to foster environmental awareness among citizens. Practice in communication skills (oral and written) which promote social responsibility and environmental protection.

ESPA 4045. SEMINAR IN LITERARY AND CULTURAL STUDIES ON WOMEN AND GENDER. Three credit hours. Three hours of lecture per week. Prerequisites: ESPA 4505 or authorization of the Director of the Department.

Exploration within a field of study in women or gender studies. Reading and discussion of primary sources. Selection of a topic, design, writing and presentation of a research project.

ESPA 4046. INTRODUCTION TO CRITICAL THEORY AND LITERARY ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Survey of the theories of literary criticism since Russian formalism. Application of critical theory to the analysis of literary texts with a comprehensive view and understanding in the hermeneutic and epistemological fields. Study of the relationship between the development of critical theory and social and historical aspects.

ESPA 4047. CALIBANAS: SHORT STORIES OF CONTEMPORARY WOMEN WRITERS OF THE HISPANIC CARIBBEAN. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisite: ESPA 3102.

Study of short stories by contemporary women writers of the Hispanic Caribbean, with an emphasis on the analysis of history, colonialism, memory, the forgotten, identity, race, sexuality, and violence, among other aspects.

ESPA 4051. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

Study of the currents of Romanticism, Post-romanticism and Realism in Spanish literature.

ESPA 4056. MODERNISM LITERATURE IN SPANISH AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Lectures with textual analysis of the principal poets and prose writers produced by "modernismo"in the various countries of Spanish America: José Marti, Salvador Díaz Mirón, Julián del Casal, José Asunción Silva, Rubén Darío, Leopoldo Lugones, Julio Herrera Reissig, Guillermo Valencia, Enrique Gómez Carrillo, Amado Nervo, Enrique González Martínez, Quiroga, María Vaz Ferrerira, José Vaconcelos, etc.

ESPA 4061. SPANISH POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A study of Spanish poetry since the origins in the Middle Age up to the present time. The tendencies, authors, and poems of all periods are considered.

ESPA 4062. SPANISH POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A study of Spanish poetry since the origins in the Middle Age up to the present time. The tendencies, authors, and poems of all periods are considered.

ESPA 4065. CONTEMPORARY SPANISH-AMERICAN POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Reading and textual analysis of Spanish American poetry after Modernism, with special emphasis on its relation to traditional modes of poetic discourse.

ESPA 4071. THE SHORT STORY IN SPANISH-AMERICA. Three credit hours per semester. Three hours of lecture per week. Prerequisite: ESPA 3102.

Lectures with textual analysis of the Spanish American short history, from its beginnings in the 19th century until the present. Consideration of tendencies, movements or schools, and authors.

ESPA 4072. THE SHORT STORY IN SPANISH-AMERICA. Three credit hours per semester. Three hours of lecture per week. Prerequisite: ESPA 3102.

Lectures with textual analysis of the Spanish American short history, from its beginnings in the 19th century until the present. Consideration of tendencies, movements or schools, and authors.

ESPA 4105. PUERTO RICAN POETRY (1930'S TO XIX CENTURY). Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study and analysis of Puerto Rican Poetry from the 19th century to the 1930's. Discussion of texts which exemplify the evolution of poetry in Puerto Rico within the respective literary, cultural and historical context. Texts written on the Island and from the Diaspora are included.

ESPA 4110. PUERTORICAN POETRY II (1940'S TO PRESENT). Three credit hours. One hour of lecture, one hour of discussion and one hour of workshop per week. Prerequisite: ESPA 3102.

Study and analysis of Puerto Rican Poetry from the 1940s to the present. Discussion of texts which exemplify the evolution of poetry in Puerto Rico within the respective literary, cultural and, historical context. Texts written on the Island and from the Diaspora will be included.

ESPA 4201. INTRODUCTION TO LINGUISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Exploration into the nature of human language through the study of the most recent models proposed by linguistic theory. Description and analysis of linguistic universals in phonetics, phonology, morphology, and syntax. Application of linguistic theory to problems in natural languages, with special attention to Spanish.

ESPA 4202. INTRODUCTION TO LINGUISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 4201.

Exploration into the nature of human language through the study of the most recent models proposed by linguistic theory. Analysis of linguistic universals in syntax, semantics and language acquisition and processing. Description of linguistic variation by means of typology, historical linguistics, and sociolinguistics. Application of linguistic theory to problems in natural languages, with special attention to Spanish.

ESPA 4215. SPANISH AMERICAN THEATER OF THE 20TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of movements, tendencies, topics and techniques of 20th century Spanish American theater through reading and discussion of representative authors and works.

ESPA 4216. SPANISH PHONETICS AND PHONOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 4201.

General scope of Spanish phonetics and phonology describing the principal phonetic and phonological contrasts of the regional and social varieties of Spanish in Spain, America and the Caribbean.

ESPA 4221. SPANISH-AMERICAN LITERATURE I. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A study of Spanish American Literature from its beginnings to the present.

ESPA 4222. SPANISH-AMERICAN LITERATURE II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A study of Spanish American Literature from its beginnings to the present.

ESPA 4227. WOMEN NARRATORS IN HISPANIC LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of narrative works produced by women writers in Spanish. Discussion of topics, value and merits within these works, with emphasis on gender perspective. Text analysis using contemporary theoretical frameworks, with particular attention to feminism, postmodernity, and postcolonialism.

ESPA 4228. CENTRAL AMERICAN WOMEN WRITERS. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Analysis of literary works of representative Central American women writers. Contrast and comparison of feminine perspectives as they appear in their works taking into account social, historical and cultural issues.

ESPA 4231. PUERTO RICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

Lectures accompanied by the reading of selected works.

ESPA 4232. PUERTO RICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

Lectures accompanied by the reading of selected works.

ESPA 4251. THE GOLDEN AGE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

The Spanish Renaissance, Humanism, Reformation and Counter Reformation, Mysticism and Asceticism; study of lyric and epic poetry, novel, prose, writings and the drama previous to Lope de Vega: Cervante's novel and Lope de Vega's dramas; Calderón, Tirso de Molina, etc. Lectures, reports, analysis of main works.

ESPA 4252. THE GOLDEN AGE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 4251.

The Spanish Renaissance, Humanism, Reformation and Counter Reformation, Mysticism and Asceticism; study of lyric and epic poetry, novel, prose, writings and the drama previous to Lope de Vega: Cervante's novel and Lope de Vega's dramas; Calderón, Tirso de Molina, etc. Lectures, reports, analysis of main works.

ESPA 4405. TECHNICAL AND SCIENTIFIC WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102 and eighteen (18) credits in major specialty.

Strategies for the production of professional documents for referential objectives; practice in the writing of technical and scientific reports, letters, proposals, and papers.

ESPA 4491. SEMINAR. One hour credit. Two hours of lecture per week. Prerequisite: ESPA 3102.

This course will train the student in preparing and classifying a bibliography, and will give him an introduction to methods and problems of research and literary criticism. Required of all students majoring in Hispanic Studies.

ESPA 4492. SEMINAR. One hour credit. Two hours of lecture per week. Prerequisite: ESPA 4491.

This course will train the student in preparing and classifying a bibliography, and will give him an introduction to methods and problems of research and literary criticism. Required of all students majoring in Hispanic Studies.

ESPA 4495. PROPOSAL WRITING. Three credit hours. One hour of lecture, one hour of discussion and one hour of workshop per week. Prerequisite: ESPA 3208 or ESPA 3215.

Strategies and objectives in writing proposals in Spanish. Analysis of the structure of a proposal. Identification of different types of proposals. Evaluation of the requirements for different funding agencies. The writing of a proposal is required.

ESPA 4505. FEMINIST CRITICAL THEORIES: READING GENDER AND SEXUALITY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Survey of feminist critical theory, its relationship to the global women's movement, with emphasis on Puerto Rico, and its links to critical theories of discourse and culture. Application of feminist theoretical literacy to the analysis of critical, literary and cultural texts, with emphasis on the 20th and 21st centuries. Practice in strategies of reading context with a perspective of gender supplemented with viewpoints from queer and diverse sexualities.

ESPA 4905. SEMINAR IN LITERATURE. Three credit hours. One hour of discussion and two hours of seminar per week. Prerequisites: (ESPA 3211-3212 and ESPA 4221-4222 and ESPA 4231-4232) or authorization of the Director of the Department.

Exploration within a field of study in Hispanic literature. Reading and discussion of primary sources. Selection of a topic, design, writing and presentation of a research project.

ESPA 4995. SPECIAL TOPICS I. One to three credit hours. One to three hours of lecture per week. Prerequisite: ESPA 3102 or authorization of the Director of the Department.

Specific aspects of language or literature not covered in the offerings of the Department. New research areas will be included.

ESPA 4996. SPECIAL TOPICS II. One to three credit hours. One to three hours of lecture per week. Prerequisite: ESPA 3102 or authorization of the Director of the Department.

Specific aspects of language or literature not covered in the offerings of the Department. New research areas will be included.

INTD 4110/CCOG 4010. INTRODUCTION TO COGNITIVE SCIENCE. Three credit hours. Two hours of lecture and one hour of discussion per week.

Integrated exploration of the fundamentals of cognitive science as the scientific study of cognition in biological and artificial systems. Conceptualization of the mind as an abstract computing device instantiated in the brain forming abstract representations of knowledge and information which are manipulated by mental processes. Analysis of the mental computations underlying cognitive functioning and how these computations are implemented by neural tissue. Discussion of the relation between cognitive science as a discipline and the findings and methods of its sub-disciplines such as linguistics, cognitive psychology, evolutionary ethology, neuroscience, computer science, Artificial Intelligence and philosophy of mind.

INTD/CCOG 4210. PHILOSOPHICAL ISSUES IN COGNITIVE SCIENCE. Three credit hours. Two hours of lecture and one hour of discussion per week.

Discussion and analysis of philosophical readings from classics to contemporary about central issues in philosophy of cognition and the mind/brain. Examination of the problem about the nature of mental states and qualia; general proposals concerning the mind/body problem (dualism, materialism, idealism, functionalism); the knowledge argument; the problem of mental causation; the relation between language and thought; the nature and function of

mental representations; perception and intentionality; the problem of consciousness as an emergent phenomenon; the problem about the existence of innate ideas and free will from a neuroscience perspective. Recent issues in the philosophy of mind and machines will be examined: the problem of the possibility of Artificial Intelligence, the argument of the Chinese room, the Turing test and computational complexity.

INTD/CCOG 4500. SPECIAL TOPICS IN COGNITIVE SCIENCE. One to six credit hours. The discussion and seminar contact hours will be according to the number of credits assigned to the course. This course may be taken several times.

Exploratory course in a cognitive science special topic.

INTD/CCOG 5010. INTRODUCTION TO NEUROSCIENCE. Three credit hours. Two hours of lecture and one hour of discussion per week.

Survey study of the nervous system, with emphasis on the structure, function and development of the human brain. Exploration of basic neuroanatomy, propagation of nerve impulses, and transfer of information between nerve cells. Analysis of cognitive and neural processes that support sensory systems, movement, emotions, memory, learning, and other domains such as language, number, music, navigation, and facial recognition. Discussion about the importance of evidence from brain pathologies and imaging techniques in cognitive science research.

INTD/CCOG 5500. ADVANCED TOPICS IN COGNITIVE SCIENCE. One to six credit hours. The discussion and seminar contact hours will be according to the number of credits assigned to the course. This course may be taken several times. Prerequisite: authorization of the Director of the Department.

Exploratory course in a cognitive science advanced topic.

INTD/CCOG 5900. RESEARCH SEMINAR IN COGNITIVE SCIENCE. One to six credit hours. The discussion and seminar contact hours will be according to the number of credits assigned to the course. This course may be taken several times. Prerequisites: (INTD 4110 and INTD 5010 and LING 4010) or authorization of the Director of the Department.

Exploration of a field of study in cognitive science. Literature search, reading and discussion of primary sources from the chosen subject. Identification and delimitation of a research problem, as well as the design of an original research project.

LING 4010. LANGUAGE IN THE HUMAN MIND: AN INTRODUCTION TO LINGUISTICS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Four credit hours equivalency for the profesor.

Introduction to linguistics as cognitive science through the study of human language as a species' biological and mental organ. Application of the scientific method to the construction of a language theory with explanatory adequacy. Characterization of the language faculty architecture and components, distinctive properties of natural versus artificial languages and communication systems, the difference between language competence and performance, and levels of structural representation in grammar. Unified exploration of empirical, philosophical and methodological issues in the scientific study of language. Discussion of the contributions of linguistics to some debates in philosophy, psychology, neuroscience, evolutionary biology, and computer science concerning the study of language, cognition and the human mind.

LING 4020. LINGUISTIC CHANGE AND VARIATION. Three credit hours. Three hours of lecture per week. Prerequisite: LING 4010.

Study of typological, diachronic, dialectal, and social variations in natural languages, with special attention to Spanish. Formulation of linguistic universals and parametrical differences in the grammatical systems of languages across the world. Phylogenetic classification of languages and analysis of phonological, morphological, syntactic and lexical changes. Discussion of the relations between social variables in speakers and their surroundings and variables in linguistic performance. Description of dialectal variations in Spanish and linguistic phenomena and systems that emerge from language contact.

LING 4080/CCOG 4080. COMPUTERS AND LANGUAGE. Three credit hours. One hour of lecture, one hour of discussion and two hours of computer laboratory per week.

Introduction to the application and implementation of programs to encode natural language in computers with a programming language. Study and practice of how to build explicit natural language representations in a computer by means of linguistic modeling using data structures, and how the computer can obtain knowledge about language by means of both data-driven and theorydriven approaches. Basic handling of data types and variables, control structures, texts and files, modules, functions, and object-oriented programming. Discussion about how computers support language-related tasks, as well as the possibilities and limitations of human language technologies.

LING 4180/CCOG 4180. COMPUTATION FOR COGNITIVE SCIENCES. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: LING 4080 or CIIC 3011 or CIIC 3015 or INGE 3016 or COMP 3010 or authorization of the Director of the Department.

Survey of computation principles with data science applications for cognitive sciences and linguistics, as well as digital humanities and other social and natural sciences. Implementation of computational mechanisms, techniques and strategies in designing experiments and understanding data, simulations, and machine learning in natural language processing and understanding.

Advanced Undergraduate and Graduate Courses

ESPA 5005. POETIC GENERATION OF 1927. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3212 or authorization of the Director of Department.

A critical and stylistic study of the Poetic Generation of 1927, considering the influence of earlier Spanish writers, and the impact of European "isms".

ESPA 5006. THE QUEERCARESQUE: QUEER INHERITOR OF THE PICARESQUE NOVEL. Three credit hours. One hour of lecture, one and a half hours of discussion and half hour of research per week. Prerequisite: ESPA 3102 or authorization of the Director of the Department.

Discussion of The Life of Lazarillo de Tormes as the groundbreaking picaresque novel as well as excerpts of other classics of this genre. A transatlantic approach among queer literatures focused on the evolution or reappropriation of the genre, narratology, technologies linked to each book according to their historicity, and the marginalized sexualities that can be traced starting with the foundational Lazarillo. Analysis and critique of how language reveals the relationship between the authors and their countries in a particular moment in time.

LING 5030. INTRODUCTION TO GENERATIVE SYNTAX. Three credit hours. Two hours of lecture and two hours of laboratory per week. Four credit hours equivalency for the profesor.

Study of syntactic structures in natural languages, with particular attention to spanish. Description and classification of syntactic features, categories, functions and operations. Representation of subordinate clauses, clitics, negation, and sentence informational structure. Analysis of phrase and sentence constituents through the application of recent generative syntactic theoretical models.

LING 5040. INTRODUCTION TO GENERATIVE PHONOLOGY. Three credit hours. Two hours of lecture and two hours of laboratory per week. Four credit hours equivalency for the profesor.

Study of phonological structures in natural languages using formal methods. Description, classification and representation of articulate sounds, prosodic structures and distinctive features. Formulation of phonological rules and ordering relations, feature geometry, tone, intonation, and metrical stress. Data analysis for the identification of

phonological patterns and processes in segments and suprasegmentals through the application of recent generative phonological theories.

LING 5050. MORPHOLOGICAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisites: LING 4010 or ESPA 4201 or INGL 3225 or authorization of the Director of the Department.

Representation of morphological structures, processes, and operations in natural languages through models proposed in generative morphology. Study of the nature of the lexicon, morphology as an autonomous module of grammar, and the interface of morphology with phonology and syntax. Revision of theories of Lexical Morphology, Prosodic Morphology, and Optimality. Application of linguistic theory to the analysis of morphological data in natural languages.

LING 5060. COMPOSITIONAL SEMANTICS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Four credit hours equivalency for the profesor.

Introduction to the study of linguistic meaning and its relationship with syntactic structure according to the principles of truth-conditional compositional semantics. Application of formal methods, model theory, and type theory to semantic analysis. Exploration of the categories of informational content, classes and relations of meaning, predication, quantification, modification, events, presuppositions, and conversational implicatures.

LING 5075. LANGUAGE ACQUISITION AND DEVELOPMENT. Three credit hours. One and a half hours of lectures and one and a half hours of seminar per week. Prerequisites: LING 4010 or ESPA 4201 or INGL 3225 or authorization of the Director of the Department.

Survey of research and theoretical perspectives in natural language acquisition and development in children. Discussion and examination of child language data from Spanish and other languages. Exploration of universal principles and biological aspects of language acquisition and development, the logical problem of language acquisition, infant speech perception and production, development of phonology, morphology, syntax, semantics and the lexicon, Universal Grammar and the language bioprogram, and child creation of creole languages.

LING 5080. COMPUTATIONAL LINGUISTICS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: LING 4010 or ESPA 4201 or INGL 3225 or authorization of the Director of the Department.

Introduction to the study and modeling of the computational properties of human language in order to develop linguistic models that may be used to test theoretical constructs about this faculty. Application of aspects of linguistic theory and formal language theory in analyzing structures in natural language and evaluating complexity and generative adequacy in models of language competence, processing and acquisition. Design and implementation of rule systems as well as phonological, morphological, syntactic and semantic representations for natural language parsers. Survey of some on-line tools, such as tagged corpora, parsers and semantic webs. Discussion of the interdisciplinary relationships between computational linguistics, natural language processing, and artificial intelligence.

LING 5090. FORMAL FOUNDATIONS OF LINGUISTIC THEORY. Three credit hours. Three hours of lecture per week. Prerequisites: LING 4010 or ESPA 4201 or INGL 3225 or MATE 3171 or authorization of the Director of the Department.

Study of the logical and mathematical foundations needed to formulate linguistic theory and formally describe properties of languages. Introduction to formal tools and basic concepts of set theory, relations and functions; infinites; propositional calculus and predicate logic; Model Theory; algebras, lattices, and automata. Application of formal methods to the analysis of the syntax and semantics of quantifiers, natural and formal languages, and types of grammars.

LING 5100. PHILOSOPHICAL FOUNDATIONS OF LINGUISTIC THEORY. Three credit hours. One and a half hours of lecture and one and a half hours of seminar per week. Prerequisites: (LING 4010 and (INGL 3225 or ESPA 4202 or ESHI 6027)) or authorization of the Director of the Department.

Critical-historic reconstruction of the fundamental concepts in linguistic theory, such as levels of adequacy in a theory of grammar; rules, representations and derivations; restrictions and locality; principles and parameters of Universal Grammar; hierarchy of formal languages and automata; the relation between thought, language and reality; I-language, meaning, truth, sense and reference, virtual conceptual necessity, dualism and methodological minimalism. Discussion of the development of linguistic theory from Cartesian rationalism to the biocognitive approach within modern and contemporary scientific thinking.

LING 5110. FOUNDATIONAL ISSUES IN BIOLINGUISTICS. Three credit hours. One and a half hours of lecture and one and a half hours of seminar per week. Prerequisites: ((LING 4010 and ESPA 4202) or ESHI 6027 or INGL 3225) or authorization of the Director of the Department.

Critical review and analysis of the canonical issues and debates in biolinguistics such as the biological factors in language design, the architecture of the language faculty, universal grammar, recursion and innatism in language adquisition and development, linguistic competence within a comparative ethological context, the nature of the genetic endowment and evolution of the language faculty, the neurological implementation and computational models of the language components and interfaces. Discussion of the contributions of anthropology, psychology, molecular and evolutionary biology, neuroscience, and computational sciences to problems in theoretical linguistics, as well as the implications of findings in biolinguistics for some controversies in these disciplines.

LING 5120. PSYCHOLINGUISTICS. Three credit hours. One and a half hours of lectures and one and a half hours of seminar per week. Prerequisites: LING 4010 or ESPA 4201 or INGL 3225 or authorization of the Director of the Department.

Introduction to the study of the mental representations and processes involved in language implementation, including the comprehension, production and storage of spoken and written linguistic information. Survey of sentential, discursive and conversational structure processing models. Exploration of the psychological reality of linguistic representations. Discussion of the contributions of psychology, computational sciences and Artificial Intelligence to problems in the design of models of natural language processing, as well as the implications of findings in psycholinguistics for some controversies in these disciplines.

LING 5170. BILINGUALISM AND SECOND LANGUAGE ACQUISITION IN CHILDREN. Three credit hours. Three hours of lecture per week. Prerequisites: LING 4010 and INGL 3225 or authorization of the Director of the Department.

Exploration of language development in bilingual and second language acquisition in children. Survey of research and theoretical perspectives in bilingualism, second language acquisition, heritage language, and foreign language learning. Analysis of children's language data in the different linguistic components: lexicon, phonology, morphology, syntax, and semantics. Discussion of existing myths about bilingual acquisition in children. Examination of the possible effects of bilingualism on a child's academic achievement, cognitive development, and first language development.

LING 5180. NATURAL LANGUAGE PROCESSING. Three credit hours. One hour of lecture, one hour of discussion and one hour of computation per week. Prerequisites: LING 4010 and (COMP 3010 or CIIC 3011 or CIIC 3015 or INGE 3016) and (ESMA 3016 or ININ 4010).

Introduction to the study of search and learning methods in designing and analyzing computational representations and algorithms for natural language processing. Implementation of linear and non-linear learning algorithms, with special attention to neural networks. Use of language models in sequence labeling and classification. Application of concepts in syntax and formal language theory to natural language parsing. Meaning representation, denotation and computation by means of compositional formalisms. Survey of on-line tools and human language technologies. Discussion of the interdisciplinary relationships between natural language processing, computational linguistics and artificial intelligence.

LING 5980. RESEARCH SEMINAR IN COMPUTATIONAL LINGUISTICS AND NATURAL LANGUAGE PROCESSING. Credits vary from zero to six credit hours. Prerequisites: (LING 5030 or LING 5080 or LING 5180) and authorization of the Director of the Department.

Development of a research project in computational linguistics or natural language processing under the supervision of a faculty member.

LING 5990. SEMINAR IN LINGUISTICS. Zero to six credit hours. One hour of discussion and two hours of seminar per week. Prerequisites: Two from LING 5030, LING 5040 or LING 5060 or authorization of the Director of the Department.

Exploration of a field of study in contemporary linguistics. Search, reading and discussion of primary sources from the chosen subject. Identification and specification of a linguistic inquiry and design of an original research project. Project completion and presentation of a technical report and/or research poster will be requiered.

DEPARTMENT OF HUMANITIES

Undergraduate Courses

ART

ARTE 3007. ARTISTIC PHOTOGRAPHY. Three credit hours. Six hours of workshop per week.

Introduction to photographic equipment, materials and processes, with emphasis on the theory and practice of artistic photography.

ARTE 3016. HISTORY AND LANGUAGE OF COMICS. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Study of the language of comics and major authors, works, series, characters and magazines of the history of European, American and Japanese comics from the perspective of Art History.

ARTE 3055. CALIGRAPHY. Three credit hours. Six hours of workshop per week.

Theory and practice of ancient and modern calligraphy.

ARTE 3057. INTRODUCTION TO MUSEUM STUDIES. Three credit hours. Two hours of lecture and one hour of discussion per week.

Theoretical and practical study of the role of museums in the conservation of cultural, natural, and scientific heritage. Analysis and interpretation of museologic and museographic tasks related to the management and communication of a museum collection.

ARTE 3121. DRAWING. Three credit hours. Six hours of workshop per week.

Introduction to materials, concepts, and techniques of artistic drawing.

ARTE 3122. PAINTING. Three credit hours. Six hours of workshop per week.

Introduction to materials, concepts, and techniques of painting.

ARTE 3131. PERSPECTIVE IN ART. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

A historical, theoretical, and practical introduction to the study of perspective in art.

ARTE 3132. COLOR. Three credit hours. Six hours of art workshop per week.

A historical, theoretical and practical introduction to the study of color in art.

ARTE 3141. DESIGN WORKSHOP. Three credit hours per semester. Six hours workshop per week each semester.

A study of the fundamental principles and elements of design in the structure and composition of the several plastic arts.

ARTE 3142. DESIGN WORKSHOP. Three credit hours per semester. Six hours workshop per week each semester. Prerequisite: ARTE 3141.

A study of the fundamental principles and elements of design in the structure and composition of the several plastic arts.

ARTE 3151. FUNDAMENTALS OF ART THEORY. Three credit hours. Three hours of lecture per week.

Study of the basic structures of works of the fine arts and of the correspondences among them, with emphasis on the plastic arts.

ARTE 3152. THEORETICAL BASES OF MODERN ART. Three credit hours. Three hours of lecture per week.

Theoretical bases of the principal schools and modes of modern plastic arts.

ARTE 3161. STAINED GLASS WORKSHOP. Three credit hours per semester. Six hours of workshop per week per semester.

Theory and practice in the artistic use of glass panels.

ARTE 3162. STAINED GLASS WORKSHOP. Three credit hours per semester. Six hours of workshop per week per semester. Prerequisite: ARTE 3161.

Theory and practice in the artistic use of glass panels.

ARTE 3200. STUDY OF THE HUMAN FIGURE. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 3121 or ARTE 3122.

Artistic study of the human figure including anatomy, proportion and movement.

ARTE 3210. PORTRAIT STUDY. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 3121 and ARTE 3122.

Introduction to the techniques of portraiture using several media such as charcoal, pencil and oils.

ARTE 3226. HISTORY OF ART IN PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of art in Puerto Rico since the period of colonization to the present.

ARTE 3235. WATERCOLOR. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Methods, materials, and techniques of watercolor.

ARTE 3276. ART APPRECIATION. Three credit hours. Three lectures per week.

A comparative study of the arts in modern times, with reference to the historic styles of major importance; analysis, evaluation, and personal interpretation of great works of art in architecture, painting, sculpture, the lesser arts and the graphic arts. Includes also a study of artistic development in Puerto Rican culture, and the valuable contributions of our artists to all phases of the island life.

ARTE 3279. EXPERIMENTATION WITH ART MATERIALS. Three credit hours. Six hours of workshop per week.

The exploration of techniques and materials in painting, sculpture, and the graphic arts.

ARTE 3531. COMPUTERS IN THE VISUAL ARTS I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ADMI 3010 or COMP 3010 or COMP 3057 or ECAG 3007 or INGE 3011 or authorization of the Director of the Department.

Introduction to the use of the microcomputer both as a medium and as a tool in the visual arts.

ARTE 3532. COMPUTERS IN THE VISUAL ARTS II. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ARTE 3531.

Creation of digitized three-dimensional images; computer animation.

ARTE 4021. CERAMIC. Three credit hours. Six hours of workshop per week.

An introduction to the materials and techniques used in the art of ceramics.

ARTE 4022. POTTERY. Three credit hours. Six hours of workshop per week.

Basic techniques in pottery emphasizing the use of the potter's wheel.

ARTE 4025. ADVANCED CERAMICS. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4021 and ARTE 4022.

Advanced study of modeling in clay, with emphasis on the commercial as well as the artistic aspects of ceramics.

ARTE 4123. ILLUSTRATION I. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 3121.

Illustration in sciences, education, and commercial and industrial promotion.

ARTE 4124. ILLUSTRATION II. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 4123 or authorization of the Director of the Department.

Advanced study of illustration in the sciences, education, and commercial and industrial publicity.

ARTE 4206. ARCHITECTURE IN PUERTO RICO. Three credit hours. Three hours of lecture per week. One and a half hour of lecture and one and a half hour of discussion per week.

Study of the most influential architectural works in Puerto Rico, situated in their historical background, in order to promote their appreciation, study their creators and relate them to social, economic and political aspects of Puerto Rico. Development of the capacity for analysis of the contemporary architectural environment and awareness of the relations between buildings and people.

ARTE 4251. RELIEF PRINTING. Three credit hours. Six hours of workshop per week.

Creative experimentation in relief and stencil printmaking techniques: monotyping, linoleum engraving, xylography and serigraphy. Analysis and interpretation of masterworks in the history of printmaking.

ARTE 4252. INTAGLIO. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Creative experimentation in printmaking techniques in gravure: intaglio, collagraph and silk aquatint. Analysis and interpretation of masterworks in the history of printmaking.

ARTE 4259. HISTORY OF MODERN ART. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4272 or authorization of the Director of the Department.

History of modern art from Neoclassicism to Impressionism.

ARTE 4260. METAL ENGRAVING. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4252.

Knowledge and practice of the techniques of metal engraving: etching, aquatint, mezzotint, burin, drypoint, and others.

ARTE 4271. HISTORY OF ART: PALEOLITHIC TO ROMAN. Three credit hours. Three hours of lecture per week. Prerequisite: HUMA 3112.

History of art from the Paleolithic age to the Roman period with emphasis on the cultures that flourished around the Mediterranean Sea.

ARTE 4272. HISTORY OF ART: EARLY CHRISTIAN TO BAROQUE. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4271.

History of art from the Early Christian period to the Baroque with emphasis on the cultures of Europe.

ARTE 4281. INTRODUCTION TO LATIN AMERICAN ART: PRE-COLUMBIAN TO INDEPENDENCE. Three credit hours. Three hours of lecture per week.

Study of selected examples of painting, architecture, and sculpture from the Pre-Columbian period to 1800 emphasizing the Hispanic Americas.

ARTE 4282. MODERN AND CONTEMPORARY ART IN LATIN AMERICA. Three credit hours. Three hours of lecture per week.

Study of selected works and representative figures of painting, architecture, and sculpture from 1800 to the present, emphasizing the Hispanic Americas.

ARTE 4291. ELEMENTARY SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Introduction to methods, materials, and tools of sculpture.

ARTE 4292. INTERMEDIATE SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4291.

Materials and forms in sculpture emphasizing the conceptual aspects of tridimensional art.

ARTE 4293. ADVANCED SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4292.

Advanced techniques and methods in sculpture emphasizing the development of artistic expression.

ARTE 4301. INDUSTRIAL DESIGN. Three credit hours per semester. Six hours workshop per week each semester.

Introduction to the theory of the design and elaboration, esthetic as well as functional and structural, of prototypes of possible industrial products in both two and three dimensions.

ARTE 4302. INDUSTRIAL DESIGN. Three credit hours per semester. Six hours workshop per week each semester. Prerequisite: ARTE 4301.

Introduction to the theory of the design and elaboration, esthetic as well as functional and structural, of prototypes of possible industrial products in both two and three dimensions.

ARTE 4311. ART CRITICISM I. Three credit hours. Three hours of lecture per week. Prerequisite: twelve credits in Arts.

Art criticism with emphasis on basic concepts and methodology.

ARTE 4312. ART CRITICISM II. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4311.

Art criticism with emphasis on the history of criticism in architecture, sculpture, and painting from the time of the ancient Greeks to present.

ARTE 4321. ART SEMINAR I. Two credit hours. Two hours of seminar per week. Prerequisites: 18 credits in Art courses.

Preparation of a research proposal under the supervision of a professor.

ARTE 4322. ART SEMINAR II. Two credit hours. Two hours of seminar per week. Prerequisites: ARTE 4321.

Preparation of a bachelor's thesis under the supervision of a professor.

ARTE 4331. COMPARATIVE ARTS. Three credit hours per semester. Three hours of lecture per week each semester.

Detailed explanation of given trends in the different art forms. The course will center around the question: to what extent is it possible to find common denominators of a particular movement in different media?

ARTE 4332. COMPARATIVE ARTS. Three credit hours per semester. Three hours of lecture per week each semester.

Detailed explanation of given trends in the different art forms. The course will center around the question: to what extent is it possible to find common denominators of a particular movement in different media.

ARTE 4335. HISTORY OF CONTEMPORARY ART. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4259.

History of contemporary art from "art nouveau" to present.

ARTE 4525. NORTHERN EUROPEAN PAINTING OF THE RENAISSANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4272.

The paintings of the Primitive Flemish, as well as the Dutch, French and German masters of the Renaissance.

ARTE 4535. ADVANCED PAINTING. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3122.

Advanced techniques and methods in painting with emphasis on the development of individual expression.

ARTE 4995. SPECIAL TOPICS. One to nine credit hours. One to nine hours of seminar or two to eighteen hours of workshop per week. Prerequisite: authorization of the Director of the Department.

Special seminars on a chosen theme in the fine arts, or in the history and theory of art.

ARTE 4996. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week or two to six hours of workshop per week. Prerequisite: authorization of the Director of the Department.

Selected topics in fine arts, plastic arts, art history or art theory.

CHINESE

CHIN 3051. CHINESE I. Three credit hours. Three hours of workshop per week.

Introduction to the mandarin chinese language with emphasis on comprehension, speaking, reading and writing skills. Development of basic sociocultural knowledge of contemporary china.

CHIN 3052. MANDARIN II. Three credit hours. Three hours of workshop per week.

Development of basic mandarin communication skills in listening, speaking, reading and writing, with a focus on listening and speaking. Introduction to chinese culture to further the acquisition of basic social, cultural knowledge of contemporary china to promote cross-cultural awareness and understanding.

FRENCH

FRAN 3060. FRENCH PHONETICS. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3141.

A study of the sounds, intonation and rhythm of the French language, with intensive laboratory practice.

FRAN 3135. SUMMER STUDY PROGRAM IN PARIS. Three credit hours. Forty hours of lecture and ten hours of practice.

A 50-hour program of summer study at the University of Paris (Sorbonne). Intensive study of French language and culture.

FRAN 3141. FRENCH I. Three credit hours. Three hours of workshop per week.

Thorough training in the fundamentals of french grammar and phonetics, exercises in composition. The direct method is used as muchas possible.

FRAN 3142. FRENCH II. Three credit hours. Three hours of workshop per week. Prerequisites: FRAN 3141 or authorization of the Director of the Department.

Thorough training in the fundamentals of french grammar and phonetics, exercises in composition. The direct method is used as much as possible.

FRAN 3143. FRENCH III. Three credit hours. Three hours of workshop per week. Prerequisites: FRAN 3142 or authorization of the Director of the Department.

Review of french grammar, study of french idioms and word groups,composition, intensive and extensive readings.

FRAN 3144. FRENCH IV. Three credit hours. Three hours of workshop per week. Prerequisites: FRAN 3143.

Review of french grammar, study of french idioms and word groups,composition, intensive and extensive readings.

FRAN 3151. BUSINESS FRENCH I. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3143.

Basic French vocabulary and style used in business and commerce.

FRAN 3155. CONVERSATION I. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3141 or authorization of the Director of the Department.

Intensive oral practice in the French language. The emphasis will be on contemporary colloquial French.

FRAN 4007. ADVANCED GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

An advanced study of French grammar by means of translations from Spanish to French.

FRAN 4008. ADVANCED COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 4115.

Intensive study of the techniques of composition, with emphasis on style and editing.

FRAN 4036. BUSINESS FRENCH II. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144 or FRAN 3151.

Advanced French vocabulary and style used in business and commerce. Emphasis on written and oral reports. Offered in French.

FRAN 4115. FRENCH COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of the techniques of composition, and of the most common French idiomatic expressions. Intensive grammar review.

FRAN 4116. CONVERSATION II. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3155.

A course in advanced French conversation, with emphasis on idiomatic expressions and common phrases, and applied grammar. Translations from Spanish to French.

FRAN 4141. FRENCH POETRY. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FRAN 3144.

Readings and interpretations of works of the most important French poets from the Middle Ages to the present; structural elements, versification, and styles. Given in French.

FRAN 4142. FRENCH POETRY. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FRAN 3144.

Readings and interpretations of works of the most important French poets from the Middle Ages to the present; structural elements, versification, and styles. Given in French.

FRAN 4145. THE FRENCH NOVEL. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

Study of five to eight outstanding novels in French Literature from the Seventeenth to the Twentieth Century, with emphasis on narrative, structural, intertextual, and socio-cultural questions. Offered in French.

FRAN 4147. MODERN FRENCH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A survey of the French novel, the poetry, and the theatre of the Twentieth Century, focusing on outstanding works and major literary movements.

FRAN 4149. FRENCH POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

French poetry from its origins to the present, with emphasis on the Nineteenth and Twentieth Centuries; analysis of the poem as a verbal construct and as expression of the individual and a culture. Offered in French.

FRAN 4151. FRENCH CULTURE AND CIVILIZATION. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: FRAN 3144.

Panoramic view of the development of French culture and civilization; its contribution to all aspects of European culture. Given in French.

FRAN 4152. FRENCH CULTURE AND CIVILIZATION. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: FRAN 4151.

Panoramic view of the development of French culture and civilization; its contribution to all aspects of European culture. Given in French.

FRAN 4181. FRENCH LITERATURE TO THE REVOLUTION. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FRAN 3144.

A study of selected works representative of the chief periods of French literature from the Middle Ages to the Revolution.

FRAN 4182. FRENCH LITERATURE TO THE REVOLUTION. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FRAN 4181.

A study of selected works representative of the chief periods of French literature from the Middle Ages to the Revolution.

FRAN 4185. HISTORY OF THE FRENCH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144 and FRAN 3060.

A study of the development of the French language from its origins to the 18th Century by means of medieval and Renaissance literary works. Emphasis on philology.

FRAN 4191. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of selected works representatives of the chief periods of French literature from the Revolution to the present.

FRAN 4192. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of selected works representative of the chief periods of French literature from the Revolution to the present.

FRAN 4236. UNDERGRADUATE RESEARCH I. One credit hour. Three hours of research per week. Prerequisite: twenty four (24) credits in French.

Techniques for research in French language, literature, and culture. All work will be in French.

FRAN 4237. UNDERGRADUATE RESEARCH II. One credit hour. Three hours of research per week. Prerequisite: FRAN 4236.

Writing and presentation of a research paper in French on a topic related to French language, literature, or culture.

FRAN 4995. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week. Prerequisite: FRAN 3144 or authorization of the Director of the Department.

Special topics in French language or culture. Course given in French.

FRAN 4996. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week. Prerequisite: FRAN 3144 or authorization of the Director of the Department.

Special topics in French language or culture. Course given in French.

GERMAN

ALEM 3041. GERMAN I. Three credit hours per semester. Three hours of lecture per week each semester.

The principal grammatical elements of the German language, practice in its oral use, exercises in composition, vocabulary drill.

ALEM 3042. GERMAN II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ALEM 3041.

The principal grammatical elements of the German language, practice in its oral use, exercises in composition, vocabulary drill.

ALEM 3043. GERMAN III. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ALEM 3042.

Thorough review of grammar, advanced composition, readings from German authors.

ALEM 3044. GERMAN IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ALEM 3043.

Thorough review of grammar, advanced composition, readings from German authors.

ALEM 4001. GERMAN LITERATURE. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: ALEM 3044.

A study of selected readings in the prose and poetry of the Nineteenth Century from Novalis to Storm and Hauptmann.

ALEM 4002. GERMAN LITERATURE. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: ALEM 4001.

A study of selected readings in the prose and poetry of the Nineteenth Century from Novalis to Storm and Hauptmann.

GREEK

GRIE 3011. ELEMENTARY GREEK I. Three credit hours. Three hours of workshop per week.

Studies in the fundamentals of classical greek, phonetics, grammar, and vocabulary. Readings in elementary texts.

GRIE 3012. ELEMENTARY GREEK II. Three credit hours. Three hours of workshop per week. Prerequisite: GRIE 3011.

Studies in the fundamentals of classical greek, phonetics, grammar, and vocabulary. Readings in elementary texts.

HUMANITIES

HUMA 3087. CLASSICS OF ITALIAN LITERATURE IN TRANSLATION. Three credit hours. Three hours of lecture per week.

Study of some of the major works of Italian literature using Spanish translations. The class will be held in Spanish.

HUMA 3111. INTRODUCTION TO WESTERN CULTURE I. Three credit hours. Three hours of lecture per week.

Critical reflection on the foundational aspects of Western culture from the diverse perspectives of humanistic disciplines such as art, history, literature, philosophy, and religious thought. Analysis of the most significant original works and texts from the Greek, Roman, Hebrew and Medieval cultures and their relation to the present.

HUMA 3112. INTRODUCTION TO WESTERN CULTURE II. Three credit hours. Three hours of lecture per week. Prerequisite: HUMA 3111.

Critical reflection on the foundational aspects of Western culture from the diverse perspectives of humanistic disciplines such as art, history, literature, philosophy, and religious thought. Analysis of the most significant original works and texts from the Renaissance to the present.

HUMA 3115. EUROPEAN STUDY TOUR. Three credit hours. Fifteen hours of lecture and one trip of one month duration.

A study of several aspects of European culture including visits to museums, monuments, and other places of cultural interest. Formal written work required.

HUMA 3271. THE BIBLE AS A LITERARY AND HISTORICAL DOCUMENT: THE OLD TESTAMENT. Three credit hours. Three hours of lecture per week.

A comparative study of the Old Testament, considering the fields of history, literature, and philosophy.

HUMA 3272. THE BIBLE AS A LITERARY AND HISTORICAL DOCUMENT; THE NEW TESTAMENT. Three credit hours. Three hours of lecture per week.

A comparative study of the New Testament, considering the fields of history, literature and philosophy.

HUMA 3401. LATIN AMERICAN CIVILIZATION AND CULTURE. Three credit hours per semester. Three hours of lecture per week each semester.

A panoramic view of the life and culture of the Latin American people from pre-Colombian times to the present day, with special emphasis on achievements in art, literature, and philosophy, as well as inter-American cultural relations.

HUMA 3402. LATIN AMERICAN CIVILIZATION AND CULTURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: HUMA 3401.

A panoramic view of the life and culture of the Latin American people from pre-Colombian times to the present day, with special emphasis on achievements in art, literature, and philosophy, as well as inter-American cultural relations.

HUMA 3411. INTRODUCTION TO THE CULTURE OF SOUTH ASIA. Three credit hours. Three hours of lecture per week.

Study of the culture of South Asia, especially that of India with emphasis on its philosophy, religion, literature and art.

HUMA 3412. INTRODUCTION TO THE CULTURE OF EAST ASIA. Three credit hours. Three hours of lecture per week.

Study of the culture of East Asia, especially those of China and Japan with emphasis on their respective philosophies, religions, literature and arts.

HUMA 3425. PUERTO RICAN THOUGHT. Three credit hours. Three hours of conference per week.

Comparative and interdisciplinary analysis of Puerto Rican cultural manifestations from the nineteenth century to the present in order to examine Puerto Rican identity and thought from the perspective of the humanities.

HUMA 4995. SPECIAL TOPICS. Three credit hours. Three hours of lecture per week. Prerequisite: HUMA 3111 or authorization of the Director of the Department.

Selected topics in Humanities.

HUMA 4996. SPECIAL TOPICS IN THE HUMANITIES. One to nine credit hours. One to nine hours of lecture per week. Prerequisite: HUMA 3111 or authorization of the Director of the Department.

Selected topics in the Humanities.

Advanced Undergraduate and Graduate Courses

HUMA 5991. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week. Prerequisites: HUMA 3112 or authorization of the Director of the Department.

Selected topics in the area of the Humanities.

HUMA 5992. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week. Prerequisite: HUMA 3112 or authorization of the Director of the Department.

Selected topics in the area of the Humanities.

ITALIAN

ITAL 3031. CONVERSATION AND CULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: ITAL 3072.

The study of Italian culture and civilization from its beginnings to our time. By means of prepared oral discussion, the contributions of Italy towards the development of western thought and science will be considered. Given in Italian.

ITAL 3032. CONVERSATION AND CULTURE. Three credit hours per semester. Three hours of lecture per week. Prerequisite: ITAL 3031.

The study of Italian culture and civilization from its beginnings to our time. By means of prepared oral discussion, the contributions of Italy towards the development of western thought and science will be considered. Given in Italian.

ITAL 3071. ITALIAN I. Three credit hours. Three hours of workshop per week.

The fundamentals of the Italian language, both oral and written, readings is elementary Italian texts, and conversation stressing the most common expressions.

ITAL 3072. ITALIAN II. Three credit hours. Three hours of workshop per week. Prerequisite: ITAL 3071.

The fundamentals of the Italian language, both oral and written; readings in elementary Italian texts, and conversation stressing the most common expressions.

ITAL 3073. ITALIAN III. Three credit hours. Three hours of workshop per week. Prerequisite: ITAL 3072.

Review of grammar; composition, readings, and oral practice.

ITAL 3074. ITALIAN IV. Three credit hours. Three hours of workshop per week.

Review of grammar; composition, readings, and oral practice.

ITAL 3085. THE ITALIAN CINEMA. Three credit hours. Three hours of lecture per week.

Post-war Italian cinema as a form of art and as a medium for conveying human, social and political messages. Offered in Spanish.

ITAL 3086. CONVERSATION IN ITALIAN. Three credit hours. One hour of conference and one two-hour of discussion per week. Prerequisite: ITAL 3072.

Conversations in Italian about current topics with emphasis on strategies of expression and argumentation. Articles and news reports in Italian from different media will be used to stimulate and develop oral communication skills.

ITAL 3087. ITALIAN CULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: ITAL 3072.

A course designed to develop knowledge of contemporary Italian culture through the study of literature, music, and film and the analysis of diverse social topics such as education, migration, and multiculturalism.

ITAL 3090. SUMMER STUDY PROGRAM IN ITALY. Three credit hours. Ten hours of lecture per week, five practice periods per week, and one one-month trip to Italy.

Intensive study of Italian language and culture in Italy.

ITAL 4007. SPECIAL TOPICS. One to three credit hours. One hour of lecture per week per credit. Prerequisite: ITAL 3074 or authorization of the Director of the Department.

Special topics in Italian language, literature, and culture. Taught in Italian.

ITAL 4011-4012. ITALIAN LITERATURE I-II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ITAL 3074.

Great works of Italian writers of the Nineteenth Century: Manzoni, Leopardi, Carducci, Foscolo, and others.

JAPANESE

JAPO 3111. JAPANESE I. Three credit hours. Three hours of workshop per week.

Fundamentals of Japanese language and culture with an emphasis on spoken language.

JAPO 3112. JAPANESE II. Three credit hours. Three hours of workshop per week. Prerequisite: JAPO 3111 or JAPO 3101.

Fundamentals of Japanese language and culture with an emphasis on spoken language, introduction to the written language.

JAPO 3211. JAPANESE III. Three credit hours. Three hours of lecture per week. Prerequisite: JAPO 3112 or JAPO 3102.

Intermediate study of Japanese language and culture. Practice of katakana, hiragana, and Chinese characters.

JAPO 3212. JAPANESE IV. Three credit hours. Three hours of lecture per week. Prerequisite: JAPO 3211 or JAPO 3201.

Intermediate study of Japanese language and culture with an emphasis on reading and writing.

LATIN

LATI 3011. ELEMENTARY LATIN. Three credit hours. Three hours of workshop per week.

Fundamentals of Latin grammar, elementary readings.

LATI 3012. ELEMENTARY LATIN II. Three credit hours. Three hours of workshop per week.

Fundamentals of Latin grammar; elementary readings.

LATI 3013. INTERMEDIATE LATIN III. Three credit hours. Three hours of workshop per week.

Latin grammar and syntax, selected readings.

LATI 3014. INTERMEDIATE LATIN IV. Three credit hours. Three hours of workshop per week.

Latin grammar and syntax, selected readings.

COMPARATIVE LITERATURE

LITE 3005. LITERATURE APPRECIATION. Three credit hours. Three hours of lecture per week.

Literature as a means of communication and aesthetic expression with particular attention to the formal elements which differentiate literary from ordinary language. Literary analysis of texts through readings from Western and non-Western societies.

LITE 3025. LITERARY THEORY. Three credit hours. Three hours of lecture per week.

A study of the principal theories of literary genres from Aristotle to the present.

LITE 3035. MYTHOLOGY IN WESTERN LITERATURE. Three credit hours. Three hours of lecture per week.

A study of the fundamental mythological themes from the Greek, Roman, German and Celtic cultures, and their manifestations in Western literature.

LITE 3041. INTRODUCTION TO COMPARATIVE LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester.

A comparative study of the fundamental themes of Western literature expressed in the classical, romantic and realistic terms.

LITE 3042. INTRODUCTION TO COMPARATIVE LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: LITE 3041.

A comparative study of the fundamental themes of Western literature expressed in the classical, romantic and realistic terms.

LITE 4011. EVOLUTION OF THE NOVEL I. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 3042. Co-requisite: LITE 3025.

Characteristics, main authors, and development of the genre of the novel from its beginnings to the 18th century.

LITE 4012. EVOLUTION OF THE NOVEL II. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 4011.

Characteristics, main authors, and development of the novel of Romanticism, Realism, and Naturalism and its transformation into the 20th century novel.

LITE 4021. COMPARATIVE DRAMA I. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 3042. Co-requisite: LITE 3025.

Representative forms of Western drama and its major authors, from the Classical era to the Middle Ages.

LITE 4022. COMPARATIVE DRAMA II. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 4021.

Representative forms of Western drama and its major authors, from the Renaissance to the present.

LITE 4035. MEDIEVAL EUROPEAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

A study of the literary genres cultivated in medieval Europe: the epic, the lyric, miracle plays and morality plays.

LITE 4045. RENAISSANCE LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

Consideration of the historical and cultural significance of the Renaissance as seen in representative works of Erasmus, Montaigne, Rabelais and the Italian neo-Platonists and neo-Aristotelian.

LITE 4051. COMPARATIVE POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 3042. Corequisite: LITE 3025.

A study of the Western lyric in its most important phases and manifestations. Original texts in Spanish and English, and translations of Provenzal, French, German, Italian and Portuguese will be used.

LITE 4052. COMPARATIVE POETRY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: LITE 4051.

A study of the Western lyric in its most important phases and manifestations. Original texts in Spanish and English, and translations of Provencial, French, German, Italian and Portuguese will be used.

LITE 4075. LITERARY CRITICISM. Three credit hours. Three hours of lecture per week. Prerequisites: LITE 3041 or ESPA 3212 or ESPA 3022.

A study of literary criticism and its influence on the development of Western literature from the ancients to our time.

LITE 4076. POSTCOLONIAL STUDIES. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

Studies of the colonial experience examined in light of postcolonial theories. Investigation of the cultural implications of colonialism and decolonization as seen in the theoretical work of various authors. The application of theoretical concepts to the interpretation of literary and cinematographic texts.

LITE 4081. ROMANTICISM IN LITERATURE I. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

Analysis of the European romantic movement by means of a comparative study of its various sources and literary expressions, from its roots in the 18th century to the development in the 19th century.

LITE 4082. ROMANTICISM IN LITERATURE II. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

Analysis of the European romantic movement by means of a comparative study of its various sources and literary expressions, from its development in the 19th century to late romanticism.

LITE 4115. CULTURAL STUDIES AND COMPARATIVE LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: 3 credits in LITE.

Cultural theory as manifested in the literary text interrelationships among the social sciences, history, and literature.

LITE 4118. THE MODERN SHORT STORY. Three credit hours. Three hours of lecture per week. Prerequisites: 3 credits in LITE.

Comparative study of the theories, themes, and formal characteristics of the short story as a modern narrative genre from its origins in the 19th century to the present in Europe and the Americas.

LITE 4990. SPECIAL TOPICS IN COMPARATIVE LITERATURE I. One to nine credit hours. One to twenty-seven hours of lecture per week. Prerequisite: six credits in LITE or ESPA.

Selected topics, authors, genres, or literary movements.

LITE 4991. UNDERGRADUATE RESEARCH I. One credit hour. Three hours of research per week. Prerequisite: 24 credits in Comparative Literature.

Selection of a research topic in comparative literature and preparation of a proposal under the supervision of a professor.

LITE 4992. UNDERGRADUATE RESEARCH II. Two to three credit hours. Six to nine hours of research per week. Prerequisite: 24 credits in Comparative Literature.

Application of research techniques to the writing of an undergraduate thesis on a topic previously selected in LITE 4991.

LITE 4996. WORKSHOP IN COMPARATIVE LITERATURE I. One to nine credit hours. One to nine hours of workshop per week.

Workshop on topics related to comparative literature.

Advanced Undergraduate and Graduate Courses

LITE/FILO 5001. LITERATURE AND PHILOSOPHY I. Three credit hours. Three hours of lecture per week .

Critical examination of the major philosophical theories of literary genres; analysis of the epistemological, metaphysical, and ethical meaning of literary texts from the ancient Greeks to the early Spanish Golden Age.

LITE/FILO 5002. LITERATURE AND PHILOSOPHY II. Three credit hours. Three hours of lecture per week.

Critical examination of the major philosophical theories of literary genres; analysis of the epistemological, metaphysical, and ethical meaning of literary texts from the end of the Spanish Golden Age to the present.

LITE 5035. THEORY OF THE NOVEL. Three credit hours. Three hours of lecture per week. Prerequisite: 9 credits in LITE, ESPA or INGL or authorization of the Director of the Department.

The development of the novel as a literary genre, emphasizing texts from the baroque to the present; a comparative analysis of narratology theories and representative novels.

LITE 5050. CONTEMPORARY LITERARY CRITICISM. Three credit hours. Three hours of lecture per week. Prerequisite: 9 credits in LITE, ESPA or INGL or authorization of the Director of the Department.

Principles and methodologies of contemporary schools of criticism; analysis of critics and texts from various literatures.

LITE 5057. MAGICAL REALISM. Three credit hours. Three hours of lecture per week. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

Magical realism in the context of world literature. Analysis of its distinguishing characteristics in the genre of fantasy through readings of its main authors, texts, and critics.

LITE 5336. WORLD LITERATURE BY WOMEN. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

The study of the themes, problems, and theories of the female gender as represented in the poetry, prose, and drama of world literature by women. Analysis of gender theory and its relation to contexts both local and global. Discussion

of the relationship between gender and themes such as race, class, community, stereotypes, representation, myth and the abject in women's literature from diverse cultures.

LITE 5615. THE SYMBOLIST MOVEMENT IN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

The development of the symbolist movement and its influence in Europe and in America, with special emphasis on poetry and the theater.

LITE 5715. METHODS IN THE STUDY OF LITERARY TEXTS. Three credit hours. Three hours of lecture per week. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

Analysis of the most important methods used in the study of literary texts, from rhetoric's, to structuralism, with emphasis on the techniques used in comparative literature.

LITE 5995. SPECIAL TOPICS IN COMPARATIVE LITERATURE I. One to nine credit hours. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

Critical analysis of authors, movements, genres, or interdisciplinary topics in comparative literature.

LITE 5996. SPECIAL TOPICS IN COMPARATIVE LITERATURE II. One to nine credit hours. Prerequisites: Nine credits in LITE or ESPA or INGL or authorization of the Director of the Department.

Critical analysis of authors, movements, genres, or interdisciplinary topics in comparative literature.

MUSIC

MUSI 3005. PUERTO RICAN MUSICAL CULTURE. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Course designed to cultivate appreciation for Puerto Rican musical tradition. Development of a concept of the aesthetics of the music that frames the profile of Puerto Rican culture. Formation of the capacity to listen objectively and critically to Puerto Rican music with different levels of complexity, epochs and styles. Review of the most important works of the Puerto Rican repertoire, in the fields of both popular music and concert music. Study of the function of music in the formation of Puerto Rican identity, our society and our history through the diverse cultural currents.

MUSI 3006. LATIN AMERICAN MUSIC. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Course designed to cultivate the appreciation of the musical traditions of Latin America. Study of the musical genres, composers and interpreters in Latin America, by way of a didactic tour of the following countries and regions Argentina, Uruguay, Chile, Brazil, Peru, Ecuador, Venezuela, Colombia, Central America, Mexico, Cuba, Haiti, Dominican Republic, and Puerto Rico. Includes an ample diversity of auditory examples, videos and demonstrations on musical instruments.

MUSI 3135. MUSIC APPRECIATION. Three credit hours. Three hours of lecture per week.

Music as a source of aesthetic pleasure, with particular emphasis on its human, philosophical and historical aspects; formal elements and their constitutions; study of the musical forms of the fugue, sonata, concerto and symphony, and of the principal tendencies in music.

MUSI 3161. HISTORY OF MUSIC. Three credit hours per semester. Three hours of lecture per week each semester.

The study of musical systems as a characteristic of great cultures; Western music from its beginning to the present; formal stylistic and technical development of music and its relation to other forms of thought and culture.

MUSI 3162. MUSIC HISTORY II. Three credit hours. Three hours of lecture per week.

The study of musical systems as a characteristic of great cultures; Western music from its beginning to the present; formal, stylistic, and technical development of music and its relation to other forms of thought and culture.

MUSI 3167. INTRODUCTION TO OPERA. Three credit hours. Three hours of lecture per week.

Study of the most significant operatic works of different periods, especially those which are in repertory.

MUSI 3171. FUNDAMENTALS OF MUSIC I. Three credit hours. Three hours of lecture per week.

An introduction to basic musical theory including; musical notation, basic harmony, auditory exercises, rhythmic and melodic dictation, analysis of minor forms, and melodic composition.

MUSI 3172. FUNDAMENTALS OF MUSIC II. Three credit hours. Three hours of lecture per week. Prerequisite: MUSI 3171 or authorization of the Director of the Department.

A study of notation and reading in various keys; rhythms, intervals, and the construction of major and minor scales; auditory exercises, rhythmic and melodic dictation, analysis of minor forms, and melodic composition.

MUSI 3231. PIANO I. One to two credit hours. Half hour of discussion and half hour of workshop per week per credit hour.

Basic introductory course designed for students who have little or no experience in playing the piano. Study of reading music scores for piano, and application of basic musical concepts, such as rhythm, melody, basic major scales, and harmony.

MUSI 3232. PIANO II. One to two credit hours. Half hour of discussion and half hour of workshop per week. Prerequisites: MUSI 3231 or placement exam.

This course is designed for students who have some experience in playing the piano. Study of reading music scores for piano, and application of intermediate to advanced musical concepts, such as rhythm, melody, the major and minor scales, and intermediate harmony.

MUSI 4016. HARMONY AND IMPROVISATION. Two credit hours. One hour of discussion and one hour of workshop per week. Prerequisites: (MUSI 3171 and MUSI 3231) or placement test.

Introductory course designed for students who are interested in musical improvisation. It includes the study and application of the basic concepts of harmony and musical notation, basic chord progressions, style and rhythm that serve as the basic framework for improvisation.

MUSI 4017. GROUP VOICE. One to two credit hours. One hour of discussion and one hour of workshop per week.

Study and practice of the fundamental concepts of vocal production including proper posture and correct breathing techniques, tone production, diction, expression, and gaining confidence. Assessment and exercises of individual and group vocal skills and techniques will be provided to help strengthen and improve voice.

MUSI 4995. SPECIAL TOPICS. One to nine credit hours. One to nine hours of lecture per week.

Selected topics related to the study of music.

PHILOSOPHY

FILO 3001. INTRODUCTION TO PHILOSOPHY: MAJOR QUESTIONS. Three credit hours. Three hours of lecture per week.

An introduction to the major questions dealt with in philosophy, such as the nature of reality, the nature of knowledge, the nature of moral and ethical behavior, the nature and purpose of government.

FILO 3002. INTRODUCTION TO PHILOSOPHY: HISTORICAL APPROACH. Three credit hours. Three hours of lecture per week.

An introduction to the major figures in the history of philosophy: Plato, Aristotle, Aquinas, Descartes, Locke, Kant, Hegel, and others.

FILO 3155. INTRODUCTION TO ETHICS. Three credit hours. Three hours of lecture per week.

Fundamentals of moral evaluation in human conduct.

FILO 3156. MODERN AND CONTEMPORARY ETHICS. Three credit hours. Three hours of lecture per week.

Modern and contemporary ethical systems, with special emphasis on Puerto Rican moral thinkers.

FILO 3157. INTRODUCTION TO LOGIC. Three credit hours. Three hours of lecture per week.

Introduction to logical thinking. Syllogisms and elementary truth functions, methods such as Venn diagrams and truth tables used to solve elementary arguments, and the nature of induction.

FILO 3158. ANCIENT PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy from the Presocratics to Plotinus.

FILO 3159. MEDIEVAL PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy from Saint Augustine to Francisco Suárez.

FILO 3165. MODERN PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy from the Renaissance to Immanuel Kant.

FILO 3166. CONTEMPORARY PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy of the nineteeth and twentieth centuries.

FILO 3167. SYMBOLIC LOGIC I. Three credit hours. Three hours of lecture per week.

The method of deduction for solving truth functions; quantification; laws of deduction extended to quantified propositions.

FILO 3168. PHILOSOPHY OF SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3171 or FISI 3161 or FISI 3151 or FISI 3091 or CIFI 3012.

Introductory philosophical exposition of the development and the fundamental assumptions of the principal concepts and theories of science, particularly of modern physics.

FILO 3169. EXISTENTIALISM. Three credit hours. Three hours of lecture per week.

Fundamental categories of human existence according to Martin Heidegger, Jean-Paul Sartre, and others.

FILO 3175. PHILOSOPHY OF HISTORY. Three credit hours. Three hours of lecture per week.

Philosophical consideration of history as a human process; principal theories.

FILO 3178. BUSINESS ETHICS. Three credit hours. Three hours of lecture per week.

Introduction to business ethics, morality in production, marketing, advertising and labor relations. Analysis of these topics in national and multinational organizations from the perspective of the Western Philosophical ethical tradition.

FILO 3185. COMPUTER ETHICS. Three credit hours. Three hours of lecture per week.

Ethical issues related to computer use, such as privacy, intellectual property, collective and individual responsibility for computer-wrought harm and computer crime.

FILO 4025. MEDICAL ETHICS. Three credit hours. Three hours of lecture per week.

Moral values involved in medical decisions, using as a basis the fundamental ethical theories of the history of philosophy.

FILO 4026. FEMINIST ETHICS. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Study of feminist theory in ethics and analysis of feminist rethinking of traditional ethics. Discussion of values and ways of thinking that are considered "feminine" and "masculine" in traditional ethics. Philosophical analysis of the capacity of gestation and birth, and its relationship with autonomy, dignity, and human flourishing; of definitions of sex and gender; of the moral experience of women in the "public sphere" and in the "private sphere", of the formation and development of moral character under oppressive systems; of practices and institutions that perpetuate oppression; and of proposals for resistance and change.

FILO 4027. BIOETHICS. Three credit hours. Three hours of lecture per week.

Moral problems related to biological research and technology.

FILO 4041. METAPHYSICS I. Three credit hours. Three hours of lecture per week.

The concepts of being, becoming, causality, essence, form and matter, quality, quantity, relation, time and space, as they emerge in ancient Greece and are integrated into Arabic and Christian thought.

FILO 4042. METAPHYSICS II. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 4041.

Metaphysical thought after the Renaissance: rationalism, critical and absolute idealism, and Heideggerian existentialism.

FILO 4045. ETHICS IN ENGINEERING. Three credit hours. Three hours of lecture per week.

Ethical responsibilities of the professional engineer in relation to colleagues, employers, and society.

FILO 4046. ENVIRONMENTAL ETHICS. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

A study of the most urgent environmental problems from the perspective of the philosophical principles given by different environmental ethics proposals.

FILO 4051. PRINCIPLES OF AESTHETICS. Three credit hours. Three hours of lecture per week.

The aesthetic experience of nature and the work of art from the point of view of both the beholder and the artist.

FILO 4052. CONTEMPORARY AESTHETICS. Three credit hours. Three hours of lecture per week.

Contemporary aesthetic school: experimental, hedonistic, psychological, psychoanalytical, sociological, phenomenological, existentialist, and others.

FILO 4105. PHILOSOPHICAL TRENDS IN LATIN AMERICA. Three credit hours. Three hours of lecture per week.

An historical and thematic examination of the basic texts of representative Latin American philosophers, such as Korn, Romero, Vasconcelos, Caso, Agremonte, Hostos, etc.

FILO 4115. PHILOSOPHY OF RELIGION. Three credit hours. Three hours of lecture per week.

Critical reflection on the nature, function and value of religious experience in its cognitive and moral dimensions.

FILO 4125. PHILOSOPHY OF LAW. Three credit hours. Three hours of lecture per week.

Philosophical analysis of the main classical and contemporary theories of the nature and function of law.

FILO 4145. SYMBOLIC LOGIC II. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3167.

The logic of relations; deductive systems; theory of classes; philosophical bases of symbolic logic.

FILO 4146. CONTEMPORARY EPISTEMOLOGY. Three credit hours. Three hours of lecture per week.

Current issues in epistemology, such as foundationalism versus coherence and internalism versus externalism. Recent writings of representative figures in the field.

FILO 4147. PHILOSOPHY OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week.

Philosophical presuppositions of scientific inquiry in psychology.

FILO 4148. PHILOSOPHY OF MARXISM. Three credit hours. Three hours of lecture per week.

Philosophical foundations of Marxism emphasizing the thought of Marx and his followers, and the relation of dialectical materialism to mechanistic materialism, empiricism, and positivism.

FILO 4149. SPECIAL TOPICS. Three credit hours. Three hours of lecture per week. Prerequisite: third or fourth year student of philosophy.

Monographic study of a specific theme in philosophy or of a major philosopher.

FILO 4155. ADVANCED ETHICS. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3155.

Comparative study of selected ethical theories.

FILO 4156. EPISTEMOLOGY AND SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3165.

Epistemological analysis of the nature, structure, and ontological implications of scientific theories, including their roles in the scientific enterprise.

FILO 4157. PHENOMENOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3166.

Theory and practice of phenomenology as a system and as a philosophical method, especially through the writings of Edmund Husserl.

FILO 4158. ANALYTIC PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisites: FILO 3165 and FILO 3166.

Analytic and linguistic philosophy of the Twentieth Century, including logical atomism, neopositivism, and linguistic analysis.

FILO 4159. PRAGMATISM. Three credit hours. Three hours of lecture per week. Prerequisites: FILO 3165 and FILO 3166.

Pragmatism as a method, a theory of knowledge, and a theory of values.

FILO 4160. PHILOSOPHY OF TECHNOLOGY. Three credit hours. Three hours of lecture per week.

Critical study of the nature and meaning of technology. Conceptual distinctions between science, technology, technique, engineering, and art, and the metaphysical, epistemological, and ethical presuppositions that inspire the diverse cultural interpretations of technology will be considered.

FILO 4991. UNDERGRADUATE RESEARCH IN PHILOSOPHY I. One to three credit hours. Three to nine hours of research per week. Prerequisite: 21 approved credits in philosophy.

Preparation of a research proposal under the supervision of a philosophy professor.

FILO 4992. UNDERGRADUATE RESEARCH IN PHILOSOPHY II. One to three credit hours. Three to nine hours of research per week. Prerequisite: 21 approved credits in philosophy.

Preparation of a senior thesis based on research conducted under the supervision of a philosophy professor.

FILO 4995. SPECIAL TOPICS IN PHILOSOPHY I. One to nine credit hours. One to nine hours of lecture per week.

Selected topics in philosophy.

FILO 4996. SPECIAL TOPICS IN PHILOSOPHY II. One to nine credit hours. One to nine hours of lecture per week.

Selected topics in philosophy.

FILO/LITE 5001. LITERATURE AND PHILOSOPHY I. Three credit hours. Three hours of lecture per week .

Critical examination of the major philosophical theories of literary genres; analysis of the epistemological, metaphysical, and ethical meaning of literary texts from the ancient Greeks to the early Spanish Golden Age.

RUSSIAN

RUSO 3011. ELEMENTARY RUSSIAN**.** Three credit hours per semester. Three hours of lecture per week per semester.

The principal grammatical elements of the Russian language, practice in its oral use, exercises in composition and vocabulary drill.

THEATER

TEAT 3051. INTRODUCTION TO THEATER ART. Three credit hours per semester. Three hours of lecture per week each semester.

A general course in the history, theory and techniques of the drama.

TEAT 3052. INTRODUCTION TO THEATER ART. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: TEAT 3051.

A general course in the history, theory and techniques of the drama.

TEAT 3081. ACTING I. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester.

A study of acting through a historical background of works about famous actors. The workshop emphasizes vocal exercise, body movement, memorization and reader's theater.

TEAT 3082. ACTING II. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester. Prerequisite: TEAT 3081.

A study of acting through a historical background of works about famous actors. The workshop emphasizes vocal exercise, body movement, memorization and reader's theater.

TEAT 3091. THEATER PRODUCTION I. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester.

A workshop to acquaint the student with the principles of theater production. Procedures of production from the reading of the play to its performance, with emphasis on props, makeup, costuming and publicity.

TEAT 3092. THEATER PRODUCTION II. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester. Prerequisite: TEAT 3091.

A workshop to acquaint the student with the principles of theater production. Procedures of production from the reading of the play to its performance, with emphasis on props, makeup, costuming and publicity.

TEAT 4011. DIRECTING I. Three credit hours. Two hours of lecture and two hours of workshop per week. Prerequisite: TEAT 3052 or nine credits in TEAT.

History and principles of stage directing.

TEAT 4012. DIRECTING II. Three credit hours per semester. Two hours of lecture and two hours of workshops per week each semester. Prerequisite: TEAT 3052 or 9 credits in Theater.

History and principles of stage directing.

TEAT 4271. PLAYWRITING I: SHORT PLAYS. Three credit hours. Two hours of lecture and one two-hour workshop per week. Prerequisite: six credits in TEAT or authorization of the Director of the Department.

Theory and practice of playwriting. Analysis of text structure. Creation of characters, dialogue, and scenes in short plays. Drafting and revision of short plays written by the students.

TEAT 4272. PLAYWRITING II: FULL-LENGTH PLAYS. Three credit hours. Two hours of lecture and one two-hour workshop per week. Prerequisite: TEAT 4271.

Theory and practice of full-length playwriting. Description of different dramatical writing techniques. Study of related formats: radio drama, television, and cinema. Drafting and revision of a full-length play written by each student.

TEAT 4995. SPECIAL TOPICS IN THEATER. One to nine credit hours. One to nine hours of lecture and workshop per week.

Exploration of various practices and diverse topics in theater such as lighting, make-up and costume design, pantomime, dramatic games, puppet theater and musical theater, among others.

TRANSLATION

TRAD 4995. TRANSLATION: THEORY AND PRACTICE. One to three credit hours. One hour of lecture, one hour of discussion and one hour of seminar per week.

History, theory, and practice of translation of texts. Interlinguistic translation will focus on different areas: literature, jurisprudence, and business, among others. The languages and the areas of translation may vary.

DEPARTMENT OF KINESIOLOGY

Undergraduate Courses

EDFI 3038. RECREATIONAL SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

Skills and techniques of recreational aquatic games.

EDFI 3040. INTRODUCTION TO KINESIOLOGY. Three credit hours. Three hours of lecture per week.

Introduction to the study of Kinesiology which includes experiencing physical activity, systematic scholarly studies, and professional practice centered in physical activity.

EDFI 3058. FUNDAMENTALS OF TRACK AND FIELD. Two credit hours. One hour of lecture and two hours of practice per week.

Theory and practice of the basic skills in track and field events.

EDFI 3075. DEVELOPMENT, TRAINING AND TECHNIQUE OF SPORTS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3058.

Theory, strategy and mechanics of coaching various interscholastic and intercollegiate track and field events.

EDFI 3076. PERSONAL TRAINING. One credit hour. One hour of conference and one hour of practice per week.

Basic programs of physical fitness designed for the individual's needs using scientific knowledge and the practice of physical activities.

EDFI 3077. FUNDAMENTALS OF SOFTBALL AND BASEBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of basic skills of softball and baseball.

EDFI 3078. TEACHING OF ULTIMATE. One credit hour. One hour of lecture and one hour of supervised practice per week.

Study of the concepts and methods of teaching Ultimate Frisbee. Effective execution of the skills necessary to practice this sport in a competitive and recreational way. Discussion of techniques for teaching these skills to foment the creation of Ultimate Frisbee programs in schools and in the community with the purpose of offering an entertaining and economical way of promoting a healthier and more physically active lifestyle.

EDFI 3090. PHYSICAL EDUCATION FOR THE PRESCHOOL LEVEL. Three credit hours. Two hours of lecture and one two-hour workshop per week.

Study of the fundamental aspects of psychomotor, cognitive, and affective development of the pre-schooler and their relation and application to physical education. Methods and techniques for the effective teaching of physical education with emphasis on the selection, organization, and evaluation of activities of movement at this level.

EDFI 3095. COACHING AND OFFICIATING BASKETBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3215.

Theory and practice in coaching and officiating basketball.

EDFI 3098. METHODS AND TECHNIQUES IN ADAPTED PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisites: EDFI 3395. Co-requisite: EDFI 3696.

Methodology in assessment, programming, service delivery and evaluation of physical education programs for individuals with disabilities since infancy. Emphasis in the administration and interpretation of tests, writing of individualized plans in physical educational within an individualized education plan (IEP) or the individualized family service plan (IFSP). Further in-dept coverage of techniques for individualizing teaching and intervention from diverse perspectives of models: developmental, functional family-centered and ecological foci.

EDFI 3106. LOW ORGANIZATION AND SPORTS LEAD-UP GAMES. Three credit hours. Two hours of lecture and two hours of practice per week. Prerequisites: EDFI 4179 and EDFI 4205.

Teaching and practice of low organization games, modified activities and introductory games to sports, in the elementary physical education curriculum. Emphasis in appropriate teaching practices aligned to content standards in the k-3rd elementary physical education in contrast to physical education 4th-6th. Includes laboratory experiences.

EDFI 3205. INTRODUCTION TO GYMNASTICS. One credit hour. One hour of lecture and one hour of practice per week.

The learning and development of skills in acrobatic, rythmic and aerobic gymnastics.

EDFI 3215. FUNDAMENTALS OF BASKETBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to basketball.

EDFI 3225. FUNDAMENTALS OF VOLLEYBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to volleyball.

EDFI 3235. SCOUTING. Two credit hours. Two hours of lecture per week.

History of scouting, troop organization, and problems in the organization of the different activities that characterize a progressive troop.

EDFI 3245. ELEMENTARY SWIMMING. One credit hour. One hour of lecture and one hour of practice per week.

A course for beginners, with emphasis on the various strokes.

EDFI 3246. AQUATIC SKILLS. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

Aquatic techniques, with emphasis on recreation: water safety, lifesaving, skin diving, and underwater fishing. Field trips required.

EDFI 3255. ADVANCED SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

A course for advanced swimmers with emphasis in the improvement of strokes.

EDFI 3265. WEIGHT LIFTING AND WEIGHT TRAINING FOR DIFFERENT SPORTS. One credit hour. One hour of lecture and one-hour laboratory per week.

Training techniques and development of skills in weight lifting and weight training for different sports.

EDFI 3285. AQUATIC SKILLS AND WATER SAFETY. One credit hour. One hour of lecture and one-hour laboratory per week. Prerequisite: EDFI 3245.

Training, techniques and development of skills in aquatic activities, and water safety.

EDFI 3295. ELEMENTARY TENNIS. One credit hour. One hour of lecture and one hour of practice per week.

Training, techniques, and development of skills in tennis.

EDFI 3296. ADVANCED TENNIS. One credit hour. One hour of conference and one hour of supervised practice per week. Prerequisite: EDFI 3295.

Development of techniques and advanced practice of tennis skills including stokes and strategies for competitive play. The student is expected to play singles and double matches applying basic and complex skills.

EDFI 3305. FOLK DANCES. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of different folk dances.

EDFI 3325. CURRICULUM IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: (EDFU 3002 or EDFU 3012) and EDFU 3007 and EDFU 4019.

Philosophy, principles and major trends in curriculum design for particular grade levels.

EDFI 3380. PHYSICAL ACTIVITIES AND THE ELDERLY. Three credit hours. Three hours of lecture per week. Prerequisite: CIBI 3002 or CIBI 3032.

Development of beneficial exercises and activities for the elderly.

EDFI 3395. ADAPTED PHYSICAL EDUCATION: EXCEPTIONALITY AND DISABILITIES. Three credit hours. Three hours of lecture per week.

Principles, state and federal laws on special education applicable to adapted physical education. Nature and needs of exceptional students and those with disabilities, in the teaching of physical education from inclusion to other least restrictive environments. Adaptations include assistive technology. Field trips of at least 15 observation hours are required. As well as an assessment project.

EDFI 3397. TEACHING PHYSICAL EDUCATION IN ELEMENTARY AND SECONDARY SCHOOLS. Three credit hours. Three hours of lecture per week.

Methods and activities for teaching physical education in elementary and secondary schools.

EDFI 3408. ADAPTED AQUATICS ACTIVITIES. Two credit hours. One hour of lecture and two hours of supervised practice per week. Prerequisites: (EDFI 3245 and EDFI 3395) or authorization of the Director.

Methods of teaching and planning aquatic activities oriented to persons with disabilities. Development and application of inclusion strategies in adapted aquatics for persons with different types of disabilities.

EDFI 3465. PERSONAL AND COMMUNITY HEALTH. Three credit hours. Three hours of lecture per week.

Basic knowledge of current individual and community health problems.

EDFI 3555. HISTORY AND PRINCIPLES OF PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week.

The origin, nature and development of physical education to the present time as formative experience and medium of education.

EDFI 3596. FUNDAMENTALS OF SOCCER. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of soccer.

EDFI 3615. COACHING AND OFFICIATING SWIMMING. Two credit hours. One hour of lecture and two one-hour laboratories per week. Prerequisite: EDFI 3245.

Theory, strategy, and techniques in coaching swimming.

EDFI 3620. TRIATHLON TRAINING. Two credit hours. One hour of conference and two hours of practice per week. Prerequisite: EDFI 3245.

Theory and practice of triathlon training and coaching.

EDFI 3645. FIRST AID AND SECURITY. Two credit hours. Two hours of lecture per week.

Incidence, causes and prevention of injuries; adequate procedures for the prevention and treatment of emergency situations.

EDFI 3649. SUMMER PRACTICUM IN ADAPTED PHYSICAL EDUCATION. Four credit hours. One hundred fifty hours of practicum. Prerequisites: (EDFI 3395 and EDFI 3645) or authorization of the Director of the Department.

Practical work and field experience for students in physical education, sports, and/or recreation programs that include persons with disabilities. The student will plan and apply strategies for the teaching of adapted physical activities to individuals with disabilities. The student will be jointly supervised by the Department of Physical Education and a qualified representative from the participating programs. The student will present a portfolio and a reflective journal upon the completion of the work done in the program.

EDFI 3665. RECREATIONAL SPORTS. Two credit hours. Two hours of lecture per week.

Methods, materials, and techniques in teaching selected recreational activities.

EDFI 3685. FUNDAMENTALS OF HANDBALL AND RACQUETBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of handball and racquetball.

EDFI 3696. LABORATORY OF METHODS AND THECHNIQUES IN ADAPTED PHYSICAL EDUCATION. One credit hour. One two-hour laboratory per week. Prerequiste: EDFI 3395. Co-requisite: EDFI 3098.

Administration of tests, scheduling of activities, and application of teaching methods in areas of physical education for individuals with disabilities.

EDFI 4000/SOCI 4000. SOCIOLOGICAL FUNDAMENTALS OF RECREATION AND SPORTS. Three credit hours. Three hours of lecture per week.

The interaction among society, sports, and recreation.

EDFI 4005. FUNDAMENTALS OF MOTOR LEARNING. Three credit hours. Three hours of lecture per week. Prerequisite: CIBI 3002 or CIBI 3032.

Aspects of physiology, psychology, and education that form the basis for understanding motor activity.

EDFI 4010./PSIC 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Psychological factors involved in motor performance and in sports.

EDFI 4016. INCLUSION IN PHYSICAL EDUCATION ACTIVITIES. Three credit hours. Three hours of lecture per week. Prerequisite: EDFI 3395.

Analysis and application of strategies for the integration of persons with disabilities in adapted physical activities. Identification of the psychomotor needs of the disabled person in order to facilitate inclusion in adapted sports activities.

EDFI 4017. ADAPTED SPORTS. Two credit hours. One hour of lecture and one two-hour laboratory per week. Prerequisite: EDFI 3395.

Teaching of sports for individuals with disabilities in mainstream or adapted settings. Design and application of lesson plans in laboratories. Adaptation of standard sports equipment and construction of assistive equipment for sports participation.

EDFI 4026. MEASUREMENT AND EVALUATION IN ELEMENTARY AND SECONDARY PHYSICAL EDUCATION. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ESMA 3101 or ESMA 3015.

Theory, methods, and practice in measurement and evaluation of elementary and secondary physical education, according to NASPE standards adopted in Puerto Rico. Students will measure the attainment of cognitive, psychomotor, and affective objectives in the teaching of physical education. Includes lectures, discussions, and laboratories in test construction and administration, and in the use of statistical packages for the analysis and evaluation of test results.

EDFI 4027. STRENGTH TRAINING AND CONDITIONING. Three credit hours. Two hours of lecture and two hours of supervised practice per week. Prerequisite: EDFI 3265 and EDFI 4105 and EDFI 4115.

Training techniques and strategies for strength and conditioning for the development of different physical abilities of young and adult elite athletes. The course will prepare the student to take the Certified Strength Conditioning Specialist examination of the *National Strength and Conditioning Association.*

EDFI 4029. ADAPTED PHYSICAL EDUCATION AND ASSISTIVE TECHNOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: EDFI 3395.

Study of the unique attributes in most disabilities specified by IDEA; adaptations and assistive technology needed to implement appropriate physical education programs. Application of educational strategies in choosing and implementing activities, assistive technology, and assessment appropriate for persons with physical or cognitive disabilities.

EDFI 4045. EVALUATION AND RESEARCH IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3015 or ESMA 3101.

Methods of evaluation and research in physical education including the use of microcomputers.

EDFI 4055. COACHING AND OFFICIATING VOLLEYBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3225.

Theory and practice in coaching and officiating volleyball.

EDFI 4065. COACHING AND OFFICIATING SOCCER. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3596.

Theory and practice in coaching and officiating soccer.

EDFI 4075. COACHING AND OFFICIATING SOFTBALL AND BASEBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3077.

Theory and practice in coaching and officiating softball and baseball.

EDFI 4106. BIOMECHANICS OF HUMAN MOVEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: MATE 3086 or MATE 3171.

Application of mechanical principles to the study of human movement with emphasis on the function of the musculoskeletal system. Identification and analysis of the mechanical and musculoskeletal factor that affect the performance of motor skills through the use of technology available for this purpose.

EDFI 4125. ORGANIZATION, ADMINISTRATION AND SUPERVISION OF PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: EDFI 3555.

Organization, administration and supervision of physical education, including intramural and interscholastic sports.

EDFI 4167. GYMNASTICS, DANCE AND FITNESS IN ELEMENTARY PHYSICAL EDUCATION. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: EDFI 4179 and EDFI 4205.

Teaching and practice of gymnastics, dance, rhythms and physical fitness activities appropriate to teaching physical education k-3rd grade and 4-6th grades. Planning and progression designs aligned to naspe content standards. Includes laboratory in elementary school.

EDFI 4176. MECHANICS OF MOVEMENT FOR CHILDREN. Three credit hours. Three hours of lecture per week.

General principles of the mechanics of movement applied to physical education in elementary school (K-6); the use of games and movement activities as a method of instruction.

EDFI 4177. EXERCISE PHYSIOLOGY (WITH LABORATORY). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: (CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)) and (ESMA 3015 or ESMA 3101).

Scientific evaluation of the effects of physical activity on human body functions in order to plan an effective training routine. Study of the mechanisms and factors related to physical fitness, fatigue, and diet.

EDFI 4179. INTRODUCTION TO MOTOR DEVELOPMENT WITH LABORATORY. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: EDFU 3001 or EDFU 3011.

Introduction to the study of motor development changes since infancy. Emphasis in motor development theories, factors, and its relation to appropriate practices in teaching and sports participation, according to motor development stages.

EDFI 4186. SPECIAL TOPICS IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in physical education. The content will vary according to interest and demand.

EDFI 4190. EXERCISE PRESCRIPTION. Three credit hours. Three hours of lecture per week.

Concepts and procedures in the prescription of exercise for physical fitness and health.

EDFI 4195. TEACHING AND TRAINING IN TENNIS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3295.

Theory and practice of teaching and training in tennis.

EDFI 4205. TEACHING METHODS AND TECHNIQUES IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisites: (EDFI 4005 or EDFI 4026) y EDFU 3007.

Philosophy, curriculum, evaluation, methods and techniques in the process of teaching physical education.

EDFI 4225. LIFEGUARDING. Three credit hours. Two hours of lecture and two hours of supervised practice per week. Prerequisite: EDFI 3285 or authorization of the Director of the Department.

The duties, responsibilities, knowledge, training, lifeguarding skills and its applications in various aquatic emergencies.

EDFI 4230. ATHLETIC TRAINING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: EDFI 3645.

Prevention, treatment, and rehabilitation of injuries related to sports.

EDFI 4250. SEMINAR IN COACHING AND OFFICIATING. Two credit hours. Two hours of lecture per week. Corequisite: eight credit hours in coaching and officiating.

Discussion and analysis of the principal issues in the field of coaching and officiating sports.

EDFI 4998. UNDERGRADUATE RESEARCH**.** From one to three credit hours. From two to four hours of research per week per credit. Prerequisites: EDFI 4045 and authorization of the Director of the Department.

A research project in Physical Education under the supervision of a professor of the department.

EDFI 5005. BIOMECHANICS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisites: (EDFI 4115 and EDFI 4045) or authorization of the Director of the Department.

The application of the laws of mechanics to the analysis of sport techniques. A research project will be required.

RECREATION

RECR 3705. COMMUNITY RECREATION. Three credit hours. Three hours of lecture per week.

Procedures for organizing and administering school and community recreation programs, social services, and youth organizations.

RECR 4135. ORGANIZATION OF RECREATION. Two credit hours. Two hours of lecture per week.

Content and organization of school, community and outdoor recreation.

RECR 4255. SEMINAR IN RECREATION. Two credit hours. Two hours of lecture per week. Prerequisites: Authorization of the Director of the Department. Corequisite: RECR 4135.

Discussion and analysis of recent literature and problems in the field of recreation.

DEPARTMENT OF MARINE SCIENCES

Advanced Undergraduate Courses

CIMA 5005. INTRODUCTION TO OCEANOGRAPHY. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Basic knowledge, techniques, and areas of interest of the different disciplines of marine sciences. The interaction and research aims in Physical, Geological, Chemical and Biological Oceanography.

CIMA 5007. INTRODUCTION TO OCEAN OBSERVATION. Three credit hours. Three hours of lecture per week.

Discussion of the scientific and practical applications of ocean observation. Evaluation of the different types of observation platforms from the most traditional such as buoys and ships to the modern autonomous submersible vehicles and satellites in polar and geostationary orbits. Investigation of the different types of physical, chemical, and biological sensors installed on these platforms, as well as their principles of operation, limitations and environmental and energy requirements. Evaluation of telemetry protocols and data storage in the operation of the observation system.

CIMA 5008. LABORATORY OF INTRODUCTION TO OCEANOGRAPHY. One credit hour. Three hours of laboratory per week. Corequisite: CIMA 5005.

Application of basic knowledge and techniques in different areas and disciplines of interest within marine sciences. The application exercises present the research aims, scopes, and interaction between Physical, Geological, Chemical, and Biological Oceanography.

CMOB 5015. FISHERIES BIOLOGY. Three credit hours. Three hours of lecture per week.

A study of the principles and methods of fisheries investigation with emphasis on the fisheries of North America and the Caribbean. Field trips.

CMOB 5017. MARINE ECOLOGY AND RESOURCE MANAGEMENT. Five credit hours. Three hours of lecture and two three-hour laboratories per week. Prerequisite: authorization of the Director of the Department.

Description of the marine environment and familiarization with the major tropical marine communities; data-gathering and biological sampling techniques; human impact on the marine environment from the standpoint of pollution, exploitation, protection, and regulation; jurisprudence in major litigation involving marine resources; management practices.

CMOF 5005. COASTAL STRUCTURES. Three credit hours. Three hours of lecture per week.

Types of coastal structures; their purpose, design, construction, and environmental impact.

CMOF 5015. PHYSICAL OCEANOGRAPHY FOR ATMOSPHERIC SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 4009 and (FISI 3172 or FISI 3162)) or authorization of the Director of the Department.

Introduction to topics in physical oceanography such as heat budget, physical properties of seawater, oceanic mixing processes, and equations of conservation of heat, salt, and momentum. Analysis of the origin of marine currents by applying the concepts of potential vorticity conservation and Sverdrup circulation. Description of the mechanics of surface and deep currents.

CMOG 5001. INTRODUCTION TO CLIMATE CHANGE. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Overview of the principles of Earth's climate covering a broad range of phenomena that influence climate at various regional and global time scales and resolutions. Discussion of climate forced by external controls. Description of the effects of internal forces and their variability, and human-induced climate change. Emphasis on the role of greenhouse gases and rates of change of these processes. Discussion of the future climate change scenarios and possible mitigating steps.

CMOG 5002. LABORATORY OF INTRODUCTION TO CLIMATE CHANGE. One credit hour. Three hours of laboratory per week. Corequisite: CMOG 5001.

Application and analyses of the principles of Earth's climate covering a broad range of phenomena forced by external controls. Laboratory exercises include the use of proxy data, climate modeling, and analysis of climate change impacts.

DEPARTMENT OF MATHEMATICAL SCIENCES

Undergraduate Courses

MATE 3000. FINITE MATHEMATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Counting techniques, probability, matrix algebra, linear programming, and systems of linear equations.

MATE 3005. PRE-CALCULUS. Five credit hours. Five hours of lecture per week. Prerequisite: placement by College Board Mathematics Advanced Exam.

A preparatory course for the calculus covering the essentials of relations, functions, complex numbers, linear algebra, trigonometry and analytic geometry.

MATE 3020. INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144 or authorization of the Director of the Department.

An introductory course in set theory and logic. Topics include the propositional calculus and set algebra, finite and infinite sets, well-ordered sets, transfinite arithmetic, Peano's axioms, and development of the real number system.

MATE 3021. CALCULUS FOR BIOLOGICAL SCIENCES I. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3172 or MATE 3174.

A basic course in differential and integral calculus of one real variable with applications.

MATE 3022. CALCULUS FOR BIOLOGICAL SCIENCES II. Three credit hour. Three hours of lecture per week. Prerequisite: MATE 3021.

Integration techniques, topics in probability, functions of several variables, introduction to differential equations, and applications.

MATE 3030. INTRODUCTION TO GEOMETRY. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Brief review of Euclidean geometry, geometric constructions, similarity of figures, geometry of the triangle and of the circle, foundations of axiomatic geometry, and elements of non-Euclidean geometry.

MATE 3031. CALCULUS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3005 or MATE 3143 or MATE 3172 or MATE 3174.

Elementary differential and integral calculus of one real variable with applications.

MATE 3032. CALCULUS II. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144.

Integration techniques, infinite series, vectors, polar coordinates, vector functions, and quadric surfaces; applications.

MATE 3040. THEORY OF NUMBERS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Divisibility, number systems, Euclid's algorithm, factorization, the distribution of primes, perfect numbers and related topics, Euler's function, indeterminate problems, diophantine problems and congruences.

MATE 3047. INTRODUCTORY PROBABILITY. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3031, and MATE 3011 and MATE 3021.

Topics to be covered include: sample spaces, events, rules, permutations and combinations, conditional probability, bayes theorem, random variables, probability distributions, mathematical expectation and variance, chevyshevs theorem, the law of large numbers, the central limit theorem, and markov chains.

MATE 3048. MATHEMATICAL ANALYSIS. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184. Corequisite: MATE 3010 or COMP 3010 or INGE 3016.

Theory and application of functions of several variables, vector calculus, first order differential equations, linear differential equations, the Laplace transform and numerical methods for solving or approximating solutions of differential equations.

MATE 3049. MATHEMATICAL ANALYSIS FOR MANAGEMENT SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Exponential functions and logarithms, of limit and continuity, differential and integral calculus of one variable, and functions of two variables with applications.

MATE 3063. CALCULUS III. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Differential and integral calculus of several variables, and an introduction to differential equations with applications.

MATE 3086. MATHEMATICAL REASONING. Three credit hours. Three hours of lecture per week.

Strategies and techniques of mathematics used in diverse areas of human endeavor: problem-solving; linear equations in one variable; proportion; linear systems of equations in two variables; basic concepts of statistics; graphical representation of data; the mathematics of finance.

MATE 3143. CALCULUS WITH PRECALCULUS I. Five credit hours. Five hours of lecture per week. Prerequisite: placement by College Board Mathematics Advanced Exam.

Introduction to the concepts of calculus of one variable with a simultaneous exposition of relevant pre-calculus topics.

MATE 3144. CALCULUS WITH PRECALCULUS II. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3143.

Techniques and applications of the differential and integral calculus with a simultaneous exposition of relevant pre-calculus topics.

MATE 3171. PRECALCULUS I. Three credit hours. Three hours of lecture and one hour of workshop per week. Prerequisites: 605 PPA or Diagnostic Exam of the Department of Mathematical Sciences.

Systems of real numbers, equations, inequalities, cartesian plane, midpoint, distance, midpoint, circle, line, basic functions, transformations of functions, operations with functions, inverse functions, complex numbers, polynomial functions and rational function. Each unit can add 20% of content.

MATE 3172. PRECALCULUS II. Three credit hours. Three hours of lecture and one hour of workshop per week. Prerequisites: MATE 3171 or MATE 3173.

Exponential functions, logarithm functions, trigonometric functions, systems of equations, matrices, determinants, sequences and series. Each unit can add 20% of content.

MATE 3181. DISCRETE MATHEMATICS I. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3005 o MATE 3172.

Sets, relations, and notation, algorithms, logic, graphs, trees.

MATE 3182. DISCRETE MATHEMATICS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3181.

Combinatorics, difference equations, relations, Boolean algebra, computational models.

MATE 4000. ELEMENTS OF TOPOLOGY. Three credit hours. Three hours of lecture per week. Corequisite: MATE 4008.

Introduction to topology including topological spaces, continuous functions and homeomorphisms, metric spaces, compact spaces, connected spaces, separation axioms, and elements of homotopy.

MATE 4003. MATHEMATICS PRACTICE FOR COOP STUDENTS I. Three credit hours per semester. Prerequisite: authorization of the Director of the Department.

Practical experience in mathematics in cooperation with private industry or government, to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the COOP organization. A report will be required of the student and the official at the end of the semester.

MATE 4004. MATHEMATICS PRACTICE FOR COOP STUDENTS II. Three credit hours per semester. Prerequisite: authorization of the Director of the Department.

Practical experience in mathematics in cooperation with private industry or government, to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the COOP organization. A report will be required of the student and the official at the end of the semester.

MATE 4007. HIGHER GEOMETRY. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Coordinate systems in Euclidean 3-space, basic configurations, vectors and geometry of n-space, transformations, introduction to projective geometry, axioms of non-Euclidean geometries.

MATE 4008. INTRODUCTION TO ALGEBRAIC STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020.

Introduction to algebraic systems; sets, semigroups, groups, rings, fields.

MATE 4009. ORDINARY DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Ordinary differential equations with applications: basic existence theorem, linear systems, the Laplace transform, series solutions, introduction to Fourier series and orthogonal functions.

MATE 4010. INTRODUCTION TO COMPLEX VARIABLES WITH APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Course designed for students who desire a working knowledge of complex variables. Topics to be covered include analytic functions, singularities, residues, complex integration, power series, conformal mapping.

MATE 4020. PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Separation of variables in the solution of partial differential equations, orthogonal expansions, Fourier series in certain function spaces, and an introduction to boundary value problems.

MATE 4021. FUNDAMENTALS OF MATHEMATICAL LOGIC. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020 or authorization of the Director of the Department.

An introductory course to the fundamental problems of logic, such as variables, the sentencial calculus, the theory of identity, the theory of classes, the theory of relations, and the deductive method.

MATE 4023. MATHEMATICS EDUCATION I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020.

Strategies for teaching mathematics at the elementary and secondary levels; analysis of innovative programs of instruction in mathematics; the use of computers in the teaching of mathematics.

MATE 4031. INTRODUCTION TO LINEAR ALGEBRA. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Euclidean vector spaces, matrices and linear equations, spectral decomposition of normal operators.

MATE 4039. THE USE OF TECHNOLOGY IN THE TEACHING OF MATHEMATICS**.** Two credir hours. One hour of lecture and one hour of discussion per week. Prerequisite: MATE 4023 and EDPE 3129.

Use and impact of technology for the exploration of mathematical concepts at the high school level, from the teaching learning process perspective. Various technologies will be used including graphing calculators, spreadsheets, dynamic geometry, and symbolic computation software, and online resources.

MATE 4040. INTRODUCTION TO MATHEMATICAL BIOLOGY. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisites: MATE 3022 or MATE 3032 or authorization of the Director of the Department.

Introduction to the use of mathematical techniques (including phase plane analysis for differential equations) applied to biological problems and processes. Application of differential and difference equations and dynamical system theory to problems in population dynamics. Discussion of discrete and continuous models describing biological phenomena. Emphasis will be given to ecological models over interacting populations and epidemiological models of infectious diseases.

MATE 4050. UNDERGRADUATE SEMINAR. One credit hour. One hour of lecture per week. Prerequisite: authorization of the Department Director.

Introduction to the methods of mathematical research; application of abstract methods to concrete situations. Recommended for all students who intend to pursue graduate studies in Mathematics.

MATE 4051. ADVANCED CALCULUS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (MATE 3020 or authorization of the Director of the Department).

A rigorous treatment of the basic ideas and techniques of mathematical analysis, including such topics as point set algebra, the real number system, functions, sequences, limits, continuity, theorems on continuous functions, uniform continuity, differentiation, Riemann integration, the Riemann-Stieltjes integral, power series, uniform convergence.

MATE 4052. ADVANCED CALCULUS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4051.

Continuation of a rigorous treatment of the basic ideas and techniques of mathematical analysis, including such topics as functions of several variables, implicit functions, Jacobians and transformations of multiple integrals, line and surface integrals, improper integrals, linear function spaces, Fourier series and orthogonal functions.

MATE 4061. NUMERICAL ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (MATE 3010 or INGE 3016 or COMP 3010).

Roots of equations, interpolation and approximation procedures, numerical integration, numerical solution of initial value problems for ordinary differential equations of first and second order, direct and iterative methods for solving systems of linear equations.

MATE 4062. NUMERICAL ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4031 and MATE 4061.

The numerical solution of Fredholm integral equations: extension of the difference calculus to functions of several variables; brief study of analytical methods for the solution of the partial differential equations of mathematical physics; the numerical solution of boundary value problems; introduction to the numerical solution of eigen value problems.

MATE 4070. CHAOS AND COMPLEXITY. Three credit hours. One and a half hours of lecture and one and a half hours of disussion per week. Prerequisites: MATE 3022- Calculus for Biological Sciencies II or MATE 3032- Calculus II or authorization of the Director of the Department.

Introduction to mathematical models for representing and analyzing both discrete and continuous, complex and chaotic dynamical systems. Concepts and techniques for system analysis include fixed points, stability, bifurcations, scale invariance, cellular automata, chaotic behavior and limit cycles. Discussion of a selection from applications to population, economic, climate, geological, physical, biological, linguistic, and computational models, among others.

MATE 4071. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Brief explanation of certain mathematical topics essential for science and engineering: infinite series, elliptic integrals, Fourier series, solution of equations, partial differentiation, multiple and line integrals.

MATE 4072. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Laplace transforms; Gamma, Beta and Bessel functions; partial differential equations and boundary value problems; vector analysis; probability, empirical formulas, and curve fitting.

MATE 4088. DIFFERENTIAL GEOMETRY USING COMPUTERS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: MATE 4009 and (MATE 4031 or authorization of the Director of the Department).

Introduction to differential geometry of curves and surfaces in three-dimensional Euclidean space, including computer-aided visualization, and numerical and symbolic computation of geometric properties.

MATE 4120. HISTORY OF MATHEMATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

A survey of the historical development of the elementary branches of Mathematics.

MATE 4145. LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: MATE 3063 and (COMP 3010 or INGE 3016 or CIIC 3011 or CIIC 3015).

Integrated approach to linear algebra and ordinary differential equations with applications in engineering. Use of software to solve differential equations and linear algebra problems.

MATE 4990. UNDERGRADUATE RESEARCH. One to six credit hours. Three hours of research per credit week. Prerequisite: authorization of the Director of the Department.

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

MATE 4997. SPECIAL TOPICS IN MATHEMATICS. One to three credit hours. One to three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Introduction to topics of Mathematics which are not normally covered in regular courses in the curriculum, and which would serve to stimulate further advanced studies in Mathematics.

Advanced Undergraduate and Graduate Courses

MATE 5016. GAME THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Mathematical theory and solution of different classes of games, such as two-person, rectangular or matrix, and multipersonal games.

MATE 5047. INTERMEDIATE DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 4009 and MATE 4031) or authorization of the Director of the Department.

Existence, continuity and differentiability of solutions; stability and lyapunov's theorem.

MATE 5049. CALCULUS OF VARIATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009 or authorization of the Director of the Department.

Origin and historical development of the calculus of variations; first variation of a functional; canonical forms of Euler's equations; second variation: sufficient conditions for weak and strong extremals; applications to problems in geometry, mechanisms and physics.

MATE 5055. VECTOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or authorization of the Director of the Department.

Introduction to vector analysis as a tool for mathematicians. The algebra and calculus of vectors, including gradient, divergence and curl, Stokes' and Green's Theorems, curvilinear coordinates, and simple N-Dimensional space. Applications in physics and geometry.

MATE 5056. TENSOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or authorization of the Director of the Department.

Cartesian tensors, Cartesian tensor fields, gradient vector, Laplacian, covariant and contravariant tensor fields, the differential line-element and the fundamental tensors, covariant differentiation and the Riemann-Christoffel tensor.

MATE 5150. LINEAR ALGEBRA. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4008 or authorization of the Director of the Department.

The study of the essentials of linear algebra, including finite dimensional vector spaces. Linear equations, matrices, determinants, bilinear forms, inner products, Spectral Theorem for normal operators and linear transformations.

COMPUTER SCIENCES

Undergraduate Courses

COMP 3010. INTRODUCTION TO COMPUTER PROGRAMMING I. Three credit hours. Two hours of conference and two hours of laboratory per week. Prerequisite: MATE 3171 or MATE 3005 or MATE 3143.

Fundamentals concepts of procedural programming. Topics include data types, control structures, functions, arrays, files, and the experience of running, testing, and debugging programs.

COMP 3015. LINUX AND FREE/OPEN SOURCE SOFTWARE FOR STEM. Three credit hour. Two hours of lecture and two hours of laboratory per week.

Introduction to different programming languages and their applications in the disciplines of science, technology, engineering and mathematics (STEM). Exploration of the different FOSS (Free and open source software) as a computational environment and as a fundamental tool for visualizing and interpreting data in these fields. Configuration and administration of the GNU/Linux operating system in order to maintain, access, and analyze STEM data. Development of "scripts" pertaining to a variety of computational operations including the collection, manipulation, processing of multidimensional data (numerical and/or symbolic), and automation of related processes.

COMP 3057. COMPUTER FUNDAMENTALS. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Historical development of computers; functions of the main hardware components and systems software; elementary concepts of programming. The laboratory will provide practical experience with some applications of the computer.

COMP 3075. INTRODUCTION TO DATA STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisites: COMP 3110 and (MATE 3181 or LING 5090).

Basic concepts of data. Linear and orthogonal lists. Representation of trees and graphs. Recovery and allocation of memory for storage. Symbol tables. Searching and sorting techniques. Data structures in programming languages. Efficiency of sorting algorithms.

COMP 3110. INTRODUCTION TO COMPUTER PROGRAMMING II. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: COMP 3010 or MATE 3010.

Methodology of object-oriented programming. Topics include searching and sorting techniques, recursion, and elementary algorithm analysis.

COMP 4006. OPERATING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 4016.

Structure and implementation of operating systems including scheduling, input-output, control and storage management, file systems and their organization, timing and synchronization.

COMP 4009. SOFTWARE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035 or COMP 3075.

Techniques used during the software development cycle, specification, design, testing, documentation, and maintenance. Use of a procedure oriented language in the design and implementation of a software project.

COMP 4016. COMPUTER ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3010.

Internal computer organization including the control processing unit, computer arithmetic, digital circuits, logical design, control units, and assembly language programming.

COMP 4017. COMPUTER ALGORITHMS. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3075.

Introduction to the design, analysis, and complexity of algorithms.

COMP 4018. DATABASE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3075.

Introduction to database system architecture and design. Topics will include the entity-relation model and the relational model. Queries, relational algebra, and the SQL language. Functional dependencies and normalization.

COMP 4025. COMPUTING MODELS. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3010 or authorization of the Director of the Department.

Various models for the modern use of computers, including operations research, and applications of probability and statistics.

COMP 4036. PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3110 or MATE 3110.

Basic aspects of programming languages including data, operations, sequence control, data control, management, operational environments, syntax, and semantics.

COMP 4046. COMPUTER GRAPHICS. Three credit hours. Three hours of lecture per week. Prerequisites: COMP 3075 and MATE 4031.

Introduction to computer graphics: graphics hardware and packages, user-interface design, geometric modeling and algorithms, image manipulation and compression.

COMP 4075. PROGRAMMING METHODOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: ((COMP 3075 or MATE 3075) and MATE 3020) or authorization of the Director of the Department.

Methods for reasoning about programs. The use of propositional and predicate calculus for programming notation and its semantics; the discipline of developing correct programs and their proofs.

COMP 4086. COMPUTER ARCHITECTURE. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3110 or COMP 3110.

Introduction to the organization and architecture of computer systems including logic circuits, addressing and management of memory, design and organization of processors, input and output of data.

SICI/COMP 4308. NETWORKING AND ROUTING FUNDAMENTALS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or SICI 4088 or COMP 3075.

Study of the terminology of computer networks and their protocols, Internet protocol (IP) addressing, introduction to network design, and networking standards. Presentation, study, and configuration of several routing protocols.

COMP 4995. COMPUTER SCIENCE PRACTICUM. Three to six credit hours. Three to six hours of practice per week. Prerequisite: authorization of the Director of the Department.

Practical experience in a computer science application jointly supervised by the department and a public or private organization.

COMP 4998. TOPICS IN COMPUTER SCIENCE I. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Selected topics in Computer Science.

COMP 4999. TOPICS IN COMPUTER SCIENCE II. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Special topics in Computer Science.

Advanced Undergraduate and Graduate Courses

ICOM/COMP 5015. ARTIFICIAL INTELLIGENCE. Three credit hours. Three hours of conference per week. Prerequisite: ICOM 4035 or authorization of the Director of the Department.

An introduction to the field of artificial intelligence: Lisp language, search techniques, games, vision, representation of knowledge, inference and process of proving theorems, natural language understanding.

COMP 5045. AUTOMATA AND FORMAL LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linearly bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems.

COMP 5055. PARALLEL COMPUTATION. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4061 and authorization of the Director of the Department.

The use of supercomputers: parallel architecture, design of algorithms for scientific computation and their implementation with parallel multiprocessors, and performance analysis.

INEL/ICOM/SICI/COMP 5318. INTERMEDIATE ROUTING, SWITCHING AND WIDE AREA NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL/ICOM/SICI/COMP 4308 or authorization of the Director of the Department.

Study and configuration of link state protocols. Study of intermediate level concepts such as switching, wide area network or WAN standards, virtual local area networks or VLAN, network design, and redundancy. Presentation and study of strategies for managing and saving address space such as variable length subnet masks and network address translation.

MATHEMATICAL STATISTICS

Undergraduate Courses

ESMA 3015. ELEMENTARY STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173 or MATE 3086.

Nature and meaning of statistics; elements of probability; normal and binomial distributions; organization of data; measures of location and variability; elements of statistical inference; simple regression and correlation. Statistical analysis through computers.

ESMA 3016. STATISTICAL DATA ANALYSIS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Pre-requisite: (MATE 3031 or MATE 3144) and COMP 3010.

Statistical data analysis including descriptive and inferential statistics and exploratory data analysis.

ESMA 3101. APPLIED STATISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Basic concepts of methods of applied statistics. Descriptive statistics: probability; random variables; probability distribution. Statistical analysis through computers.

ESMA 3102. APPLIED STATISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3101.

Sampling, elements of estimation and tests of hypotheses, regression and correlation analysis, chi-square and contingency tables.

ESMA 4001. MATHEMATICAL STATISTICS I. Three credit hour. Three hours of lecture per week. Prerequisite: MATE 3032.

Nature of statistics, probability, random variables and their probability distributions, moment generating functions, sampling distributions and the central limit theorem.

ESMA 4002. MATHEMATICAL STATISTIC II. Three credit hour. Three hours of lecture per week. Prerequisite: ESMA 4001 and MATE 3063.

Multivariate probability distributions, methods of estimation, tests of hypotheses, linear models, design of experiments, analysis of variance, and contingency tables.

ESMA 4005. NON-PARAMETRIC APPLIED STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3102 or ESMA 4001 or ESTA 3002.

Non-parametric statistical techniques applied to independent samples and correlated samples; independence and homogeneity of factors; computation of point estimates and confidence intervals for parameters, and the testing of hypotheses.

ESMA 4006. STATISTICS FOR THE BIOLOGICAL SCIENCES. Three credit hours. Two hours of lectures and a two-hour laboratory per week. Prerequisite: MATE 3021.

Statistics methods applied to the biological sciences. Includes descriptive statistics, probability, statistical inference, variance analysis, categorical data analysis, regression analysis, and sampling methods. Intensive use of statistical computer packages.

ESMA 4016. DATA MINING AND MACHINE LEARNING. Three credit hours. Three hours of lecture per week. Prerequisites: (ESMA 3016 and MATE 4031) or authorization of the Director of the Department.

Introduction to the techniques for data mining and machine learning applied to both supervised and unsupervised learning. Basic concepts of regression and classification, nearest neighbor methods, decision trees, boosting, neural networks and support vector machines.

ESMA 4038. SAMPLING METHODS. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3102 or ESMA 4001 or ESTA 3002.

Introduction to the theory and application of statistical sampling methods.

Advanced Undergraduate and Graduate Course

ESMA 5015. STOCHASTIC SIMULATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 4001 or authorization of the Director of the Department.

Basic methods of simulation, modeling of complex systems, simulation languages, generation of random numbers, model validity, analysis of solutions, variance reduction techniques, and the design of experiments.

DEPARTMENT OF NURSING

Undergraduate Courses

ENFE 3005. INTRODUCTION TO NURSING. Three credit hours. Three hours of lecture per week.

The historical development of nursing, its evolution and current trends; introduction to the concept of professional nursing.

ENFE 3007. DECISION-MAKING IN NURSING. Three credit hours. Three hours of lecture per week. Prerequisite: ENFE 3005.

Discussion and analysis of concepts and principles inherent to the process of decision-making in nursing. Emphasis in the models and theoretical frameworks for the decision-making process in clinical situations in diverse health service scenarios. Integration of concepts such as problem solving, reflexive and critical thinking, values and ethics from a nursing perspective, when providing care to clients in different cultural contexts. Emphasis on the role of the nursing profession and the impact on the client system.

ENFE 3015. INTERPERSONAL RELATIONSHIPS IN NURSING. Three credit hours. Three hours of lecture per week. Prerequisite: (PSIC 3002 and ENFE 3005) or authorization of the Department Director.

Introduction to the study of nursing as a therapeutic interpersonal process.

ENFE 3021. INTRODUCTION TO CLINICAL NURSING I. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisites: (ENFE 3005 and (CIBI 3002 or CIBI 3032)) or authorization of the Director of the Department. Corequisites: (BIOL 3715, BIOL 3716 and ENFE 3015) or authorization of the Director of the Department.

Fundamental concepts, knowledge and skills necessary for the practice of nursing in any clinical area.

ENFE 3022. INTRODUCTION TO CLINICAL NURSING II. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisite: ENFE 3021. Corequisite: ENFE 3035.

Development of more complex clinical nursing skills.

ENFE 3025. FUNDAMENTALS OF GERONTOLOGY. Three credit hours. Three hours of lecture per week.

Study and analysis of fundamental aspects of the elderly population such as perceptions of aging and old age, demographic aspects, bio-psycho-social and spiritual changes, promotion and maintenance of health, and legal considerations. Development of knowledge, skills, and attitudes for the adequate management of the needs and special problems of the elderly population.

ENFE 3035. FUNDAMENTALS OF NUTRITION. Two credit hours. Two hours of lecture per week. Corequisite: ENFE 3022.

Basic concepts of nutrition, and its relation to health maintenance; nutritional requirements of various members of the family; psychological, cultural and economic factors which influence nutrition, with emphasis on low cost adequate nutrition; dietary problems in various illnesses.

ENFE 3045. PSYCHIATRIC NURSING. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: ENFE 3015. Corequisite: ENFE 3022.

Care and rehabilitation of mentally ill adults and children. Integration of in-patient care with local resources and family.

ENFE 3095. POSOLOGY AND PHARMACOLOGY FOR NURSING. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisites: authorization of the Director of the Department.

Concepts of posology and pharmacology related to Nursing, including the nature, administration, action and reaction, and dosage of common drugs.

ENFE 3116. FORENSIC NURSING IN SEXUAL ASSAULT. Three credit hours. Three hours of lecture per week. Prerequisite: ENFE 3021.

Discussion and analysis of the essential aspects of forensic nursing including the role of nurses with rape victims from a bio-psycho-social intervention, until the conviction of the aggressor. Familiarization with suitable methods for case reporting, documenting, and testifying in court. Discussion of the legal aspects in the care of sexual assault victims and the laws related to this crime. Consideration of relevant aspects for obtaining the S.A.N.E (Sexual Assault Nurse Examiner) certification.

ENFE 3126. BASIC PRINCIPLES OF PHARMACOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: ENFE 3022.

Discussion of the basic interactions of drugs and their effects on humans, considering all systems: cardiovascular, renal, endocrine, immune and nervous, among others. Analysis of drugs from the perspective of their action, dosage, adverse reactions and interaction. Emphasis on the study of pharmacokinetics and pharmacodynamics of drugs.

ENFE 3127. HEALTH ASSESSMENT. Three credit hours. Two hours of lecture and one hour of laboratory per week. Prerequisite: BIOL 3715 and BIOL 3716.

The course provides theoretical and technical skills in simulated practice settings towards achieving competency in conducting health assessment: health history, physical examination, analysis of findings, and care planning.

ENFE 3305. NURSING IN HEALTH PROMOTION. Three credit hours. Three hours of lecture per week.

Concepts, models, and theories related with health promotion. Focus on professional nursing, functions in health promotion for individuals, families, and communities.

ENFE 3315. FUNDAMENTALS OF THANATOLOGY. Three credit hours. Three hours of lecture per week.

Theories, issues, and research related to the dying person, death, bereavement and its implications in the practice of health professions.

ENFE 3316. PALLIATIVE AND END OF LIFE CARE. Three credit hours. Three hours of lecture per week. Prerequisite: ENFE 3021.

This course provides knowledge and skills in palliative and end of life care throughout the human growth and developmental stages.

ENFE 4001. MATERNAL AND NEONATAL NURSING. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: ENFE 3022 and ENFE 3035 and ENFE 3045. Corequisite: BIOL 3725.

Theory and clinical experience in maternal and neonatal care following a family-centered approach.

ENFE 4002. PEDIATRIC NURSING. Six credit hours. Two hours of lecture and two six-hours laboratories per week. Prerequisite: ENFE 4001.

Theory and clinical experiences in pediatric care considering the growth and development stages in a family centered approach and their environment.

ENFE 4015. MANAGEMENT OF NURSING SERVICES. Three credit hours. Three hours of lecture per week. Prerequisites: ENFE 4002 or authorization of the Director of the Department.

Identificaction and application of principles of management in planning and providing nursing care.

ENFE 4025. COMMUNITY HEALTH NURSING. Six credit hours. Two hours of lecture and two six-hours laboratories per week. Prerequisites: ENFE 4002 or authorization of the Director of the Department. Corequisite: ESMA 3015.

Concepts and principles of community health and public health nursing, community health problems, vital statistics, health services and basic skills in community health nursing.

ENFE 4026. LEGAL ASPECTS OF NURSING. Two credit hours. Two hours of lecture per week. Prerequisite: ENFE 3021 or its equivalent.

Legal implications in Nursing Practice.

ENFE 4031. MEDICAL-SURGICAL NURSING I. Six credit hours. Two hours of lecture and two-six hours laboratories per week. Prerequisites: ENFE 4002 or authorization of the Director of the Department.

Theories, concepts and principles which underlie nursing interventions in the care of the medical surgical client from young adult into old age. Discussion of conditions on immunologic, endocrine, cardiovascular and respiratory system.

ENFE 4032. MEDICAL-SURGICAL NURSING II. Six credit hours. Two hours of lecture and two-six hours laboratories per week. Prerequisite: ENFE 4031.

Theories, concepts and principles which underlie nursing interventions in the care of the medical surgical client from young adult into old age. Discussion of conditions on genitourinary, neurological, sensorial, gastrointestinal and musculoskeletal systems.

ENFE 4041. SEMINAR IN NURSING I. One credit hour. One hour of lecture per week. Prerequisites: ENFE 4002 or authorization of the Director of the Department. Corequisite: ESMA 3015.

Research in nursing: the application of the scientific method for the conception and definition of a research problem; its ethical and legal aspects.

ENFE 4042. SEMINAR IN NURSING II. One credit hour. One hour of lecture per week. Prerequisite: ENFE 4041 and ESMA 3015. Corequisite: ESMA 3015.

Research in nursing: the planning and implementation phases in the research process; its application to the solution of problems in health care services. A written proposal will be required.

ENFE 4991. UNDERGRADUATE RESEARCH I. One to three credit hours. Three to nine hours of research per week. Prerequisites: ENFE 3022 and authorization of the Director of the Department.

Supervised research in nursing.

ENFE 4992. UNDERGRADUATE RESEARCH II. One to three credit hours. Three to nine hours of research per week. Prerequisites: ENFE 4991 and authorization of the Director of the Department.

Supervised research in nursing.

ENFE 4995. COOP PRACTICE. Three to six credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in nursing in cooperation with private industry or government, jointly supervised by the Nursing Department, the COOP program Coordinator, and an official from the cooperating organization.

ENFE 4996. SPECIAL TOPICS IN NURSING. One to three credit hours. One to three hours of lecture per week.

Discussion and analysis of selected topics in Nursing.

ENFE 5005. HEALTH ASSESSMENT. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: (BIOL 3715 and BIOL 3716) or authorization of the Director of the Department.

Directed experiences toward achieving competency in conducting health assessment: health history, physical examination, analysis of the data, and planning for care.

ENFE 5115. WOMEN AND HEALTH: INTEGRAL PERSPECTIVE IN SEXUAL AND REPRODUCTIVE HEALTH. Three credit hours. Three hours of lecture per week.

This course will include a depth discussion of the sexual and reproductive health of women in Puerto Rico from a holistic perspective emphasizing the clinical and social component. Nurses and health care professionals interested in this topic, will be prepared within his/her roles and responsibilities to attend the Puerto Rican Women's need using resources and services available.

ENFE 5397. APPLIED PATHOPHYSIOLOGY. Three credit hours. Three hours of lecture per week.

Analysis of pathophysiological alterations occurring within the geriatric health-illness continuum. Particular attention is placed on risk, mitigation of chronicity, and health repercussions for the geriatric client in critical condition.

ENFE 5665. THEORIES OF NURSING. Three credit hours. Three hours of lecture per week.

Analysis and discussion of theories in nursing, such as system, self-care, and environmental theories and their relevance to education, practice, and research.

ENFE 5667. EKG INTERPRETATION: NURSING CARE. Three credit hours. Three hours of lecture per week.

Analysis of the electrophysiological manifestations of the heart's conduction system. Discussion of the electrophysiological, ischemical, and structural changes which are represented in the electrocardiogram (EKG). Detection of health problems and the application of knowledge to the diagnosis, treatment, and nursing care.

DEPARTMENT OF PHYSICS

Undergraduate Courses

FISI 3000. ORIENTATION FOR PHYSICS MAJORS. Non-credit. One hour seminar per week. Prerequisite: student in the Physics Department.

Academic and professional orientation for students entering the Department of Physics.

FISI 3028. ELECTROMAGNETISM FOR TEACHERS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3027.

Introduction to electromagnetism for high school teachers, including teaching methodologies and techniques. Topics include Coulomb's Law, electric fields, electric potential, circuits, magnetic force, Biot-Savart's law, magnetic induction, and electromagnetic waves.

FISI 3029. MODERN PHYSICS FOR TEACHERS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3028.

Introduction to modern physics for high schools teachers, including methodologies and techniques. Topics include special relativity, the photoelectric effect, blackbody radiation, the Compton effect, atomic spectra, Bohr's atom, quantum mechanics, and nuclear physics.

FISI 3066. INTRODUCTORY TOPICS IN PHYSICS. One credit hour. One hour of lecture per week.

Introduction to physics as a discipline of study and as a professional career. Discussion of topics of interest in physics, presentations of research in the Physics Department and development of effective study techniques. Discussion of useful tools such as dimensional analysis and quantitative estimation.

FISI 3091. ELEMENTS OF PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3172 or MATE 3174 or MATE 3005 or MATE 3143.

Basic concepts of mechanics, thermodynamics, optics, and electromagnetism oriented specially towards agriculture.

FISI 3092. ELEMENTS OF PHYSICS LABORATORY. One credit hour. One two-hour laboratory per week. Corequisite: FISI 3091.

Laboratory exercises and demonstrations applying the principles studied in FISI 3091.

FISI 3151. MODERN COLLEGE PHYSICS I. Three credit hours. Three hours of lecture per week. Corequisite: MATE 3021or MATE 3031 or MATE 3144 or MATE 3183.

Mechanics, heat, sound, electricity, magnetism, and optics, differential and integral calculus will be used as much as possible.

FISI 3152. MODERN COLLEGE PHYSICS II. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3151.

Mechanics, heat, sound, electricity, magnetism, and optics. Differential and integral calculus will be used as much as possible.

FISI 3153. MODERN COLLEGE PHYSICS LABORATORY. One credit hour per semester. One two-hour laboratory per week each semester. Corequisite: FISI 3151.

This course is to supplement FISI 3151-3152.

FISI 3154. MODERN COLLEGE PHYSICS LABORATORY. One credit hour per semester. One two-hour laboratory per week each semester. Corequisite: FISI 3152. Prerequisite: FISI 3153.

This course is to supplement FISI 3151-3152.

FISI 3161. GENERAL PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183.

Principles of mechanics, acoustics, and thermodynamics, with application to classical and modern physics.

FISI 3162. GENERAL PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: FISI 3161 or FISI 3171.

Principles of electricity, magnetism, and optics, with application to classical and modern physics.

FISI 3163. LABORATORY OF GENERAL PHYSICS I. One credit hour. One two-hour laboratory per week. Corequisite: FISI 3161 or FISI 3171.

Experiments in mechanics, waves, and thermodynamics to complement FISI 3161.

FISI 3164. LABORATORY OF GENERAL PHYSICS II. One credit hour. One two-hour laboratory per week. Prerequisite: FISI 3163 or FISI 3173. Corequisite: FISI 3162 or FISI 3172.

Experiments in electricity, magnetism, and optics to complement FISI 3162.

FISI 3171. PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144.

Principles of mechanics, waves, and thermodynamics for engineering and physical sciences.

FISI 3172. PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: FISI 3171 or FISI 3161.

Principles of electricity, magnetism, optics, and modern physics for engineering and the physical sciences.

FISI 3173. PHYSICS LABORATORY I. One credit hour. A two-hour laboratory per week. Corequisite: FISI 3171 or FISI 3161.

Experiments in mechanics, waves, and optics to complement the PHYSICS I course.

FISI 3174. PHYSICS LABORATORY II. One credit hour. A two-hour laboratory per week. Prerequisite: FISI 3173 or FISI 3163. Corequisite: FISI 3172 or FISI 3162.

Experiments in electricity, magnetism, and modern physics to complement the PHYSICS II course.

FISI 4001. SEMINAR I. One credit hour. Two hours of seminar per week. Prerequisite: authorization of the Director of the Department. Corequisite: FISI 4063.

Discussion and reports of special topics in physics.

FISI 4002. SEMINAR II. One credit hour. Two hours of seminar per week. Prerequisite: FISI 4001.

Discussion and reports of special topics in physics.

FISI 4007. PHOTOGRAPHY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Study of lens systems, basic photochemistry, composition, light and color balance; laboratory practices and techniques of the darkroom; appropriate use of natural and artificial light.

FISI 4017. OPTICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172.

Survey of main themes of classical optics, emphasizing the representation of light as a wave, but including geometrical optics and its applications to simple optical instruments. Interference and diffraction phenomena, from the viewpoint of light as a scalar wave will be discussed. Light will be described as an electromagnetic wave and interaction of light with matter, including phenomena of reflection, refraction, absorption, scattering, polarization, and birefringence will also be considered.

FISI 4020. PHYSICS OF WAVES. Three credit hours. Three hours of lecture per week. Corequisite: MATE 4009 or MATE 4145.

Study of the physics of wave phenomena including their underlying principles, mathematical analysis, and their applications. Discussion of topics in harmonic oscillations, waves in multiple dimensions, fourier analysis, polarization, interference, and diffraction.

FISI 4049. ELECTRONICS. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisites: (FISI 3164 or FISI 3174 or FISI 3154) and (FISI 3162 or FISI 3172 or FISI 3152).

Discussion of AC circuits theory, vacuum tubes, transistors, power supplies, amplifiers, oscillations, servo systems, operational amplifiers, electronic switching and other electronic circuits. Laboratory exercises are designed so that students develop a practical knowledge of electronic circuits.

FISI 4051. INTERMEDIATE MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: (FISI 3162 or FISI 3172) and (MATE 3063 or MATE 3185).

A study of kinematics, dynamics, gravitation, and motion of rigid bodies; elasticity, hydrostatics and hydrodynamics; vibration and wave motion.

FISI 4052. DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 4051.

Dynamics of particles and rigid bodies. Lagrange and Hamilton´s equations of motion and related matters.

FISI 4057. THERMAL PHYSICS**.** Three credit hours. Three hours of lecture per week. Prerequisite: (FISI 3162 or FISI 3172 or FISI 3012) and (MATE 3063 o MATE 3185).

A study of the three laws of thermodynamics, equations of state, phase transitions, and thermodynamics potentials, with an introduction of classical and quantum statistics and applications of the distribution functions of Boltzman, Bose-Einstein, and Fermi-Dirac.

FISI 4063. QUANTUM MECHANICS I. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 4052 and MATE 4009) or authorization of the Director of the Department.

The course is an introduction to quantum mechanics. The Schrödinger equation, its interpretation, and its applications to one and three dimensional problems will be studied, including the harmonic oscillator, the hydrogen atom, angular momentum, and spin. The matricial operator formalism will be presented and applied to quantum mechanics.

FISI 4064. QUANTUM MECHANICS II. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 4063.

Study of the general theory of angular momentum, identical particles, and an introduction to quantum statistical mechanics, as well as time-independent perturbation theory, approximation methods, time-dependent perturbation theory, and scattering.

FISI 4071. ELECTRICITY AND MAGNETISM. Three credit hours. Three hours of lecture per week. Prerequisite: (MATE 3063 or MATE 3185) and (FISI 3162 or FISI 3172).

Electrostatics and magnetostatics in vaccum and matter. Determination of electric fields for charge distributions and stationary currents, and special techniques for the calculation of electric potential. Solutions to Laplace and Poisson equations, study of magnetic vector potential and Maxwell's equations.

FISI 4076. INTERMEDIATE LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: FISI 3164 or FISI 3174 or FISI 4049.

Includes intermediate laboratory experiments in mechanics, electricity, magnetism, and modern physics, stressing the importance of precision measurements and appropriate experimental techniques.

FISI 4077. INTERMEDIATE LABORATORY II. Two credit hours. One six-hour laboratory per week. Prerequisite: FISI 4076.

Includes intermediate laboratory experiments in wave phenomena, solid state, atomic, nuclear, and molecular physics. The student will acquire general research laboratory techniques in spectroscopy, electric and magnetic measurements, vacuum systems, and low temperatures.

FISI 4078. INTRODUCTION TO CLASSICAL ELECTRODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009 and FISI 4071.

Introduction to concepts and techniques of classical electrodynamics based on maxwell's equations. Electromagnetic wave propagation in continuous media and wave guides, radiation emission by accelerated charges and antennas, and the fundamentals of relativistic electrodynamics will be discussed.

FISI 4105. MODERN PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172 or (FISI 4106 and FISI 4107) or authorization of the Director of the Department. Corequisite: FISI 4126 if the student took (FISI 4106 and FISI 4107).

A study of topics of twentieth century physics, including relativity theory, radiation, atomic structure of hydrogen-like atoms, introduction to the Schrödinger equation, radioactivity and selected topics in nuclear and solid-state physics.

FISI 4106. CONCEPTS AND LAWS IN MECHANICS. Four credit hours**.** Three hours of lecture and three hours of laboratory per week. Prerequisites: MATE 3032 and ((FISI 3152 and FISI 3154) or (FISI 3172 and FISI 3174)).

Theoretical and practical study of the phenomena, laws and principles of classical mechanics, including applications to daily life occurrences. The course is designed to prepare students to become high school teachers.

FISI 4107. CONCEPTS AND LAWS OF HEAT AND WAVES. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: MATE 3032 and ((FISI 3152 and FISI 3154) or (FISI 3172 and FISI 3174)).

Theoretical and practical study of the phenomena and laws of heat, oscillations and waves, as well as the use of the laws of thermodynamics in the analysis of problems. The course is designed to prepare students to become physics teachers in secondary education.

FISI 4117. INTRODUCTION TO RELATIVITY. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3152 or FISI 3162 or FISI 3172 or authorization of the Director of the Department.

Introduction to the theories of relativity. Development of the Special Theory of Relativity and its implications for Newtonian mechanics and electromagnetism. Study of the main concepts and results of General Relativity Theory and their applications to topics of interest.

FISI 4118. ELEMENTS OF MODERN PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 4106 and FISI 4107. Corequisite: FISI 4126.

Study of Special Relativity postulates and their consequences in a general understanding of space and time. A discussion about mass, velocity, linear momentum, energy, force, and conservation principles in the context of Special Relativity. The study of Quantum Mechanics postulates and their implications to the understanding of the fundamental underpinnings of material interactions at the subatomic and submolecular spatial scales. Study of foundational experiments, phenomena and applications relevant to the development of modern physics.

FISI 4125. COMPUTATIONAL PHYSICS. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: (INGE 3016 or MATE 3010 or COMP 3010 or CIIC 3011 or CIIC 3015) and (FISI 3152 or FISI 3162 or FISI 3172).

Introduction to computer techniques and their applications in Physics.

FISI 4126. CONCEPTS AND LAWS OF ELECTRICITY AND MAGNETISM. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: MATE 3032 and ((FISI 3152 and FISI 3154) or (FISI 3172 and FISI 3174)).

Theoretical and practical study of phenomena and laws to electricity, magnetism, electromagnetic radiation and basic circuits, as well as the use of relevant measurement instruments. The course is designed to prepare students to become physics teachers in secondary education.

FISI 4127. TEACHING METHODOLOGIES OF PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 4106 and FISI 4107. Corequisite: FISI 4126.

Study of the most effective strategies for teaching theoretical and experimental Physics at the pre-college level, as well as of problem-solving techniques. Classification and discussion of the most common misconceptions in the comprehension and interpretation of principles and laws of Physics. The course is designed to prepare students to become high school Physics teachers.

FISI 4135. APPLIED OPTICS. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: FISI 4017.

Current topics in applied optics including: radiometry and photometry, light detectors, optical fibers and wave guides, Fourier optics and optical image processing, holography, electro-optics, and integrated optics.

FISI 4797. COSMIC EVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3172 or FISI 3162 or FISI 3152.

Discussion of the laws and concepts of physics (both classical and modern) required to interpret and explain the major evolutionary stages of the cosmos, from the "Big Bang" up to the emergence of intelligent life. Presentation of the logical sequence of evolutionary development, from the primordial soup of radiations and quarks up to the complex chemistry in a planet with conscious and technological life.

FISI 4871. INTRODUCTION TO ELEMENTARY PARTICLE PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 4105- Modern Physics. Corequisite: FISI 4063- Quantum Mechanics I.

Study of the physics of elementary particles, their classification and interactions. Discussion of Feynman diagrams and the characteristics of the quarks model, qualitative and quantitative aspects of the Quantum Electrodynamics,

Quantum Chromodynamics and Weak Interactions theories. Analysis of fundamental questions such as: what is matter, why do particles have mass, which are the known particles and why do they exist and where is anti-matter found.

FISI 4996. COOP PRACTICE. Three to six credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in physics in cooperation with private industry or government to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the cooperating organization.

FISI 4997. SPECIAL PROBLEMS PHYSICS. One to nine credit hours. One to nine hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Short research problems, assigned or selected, subject to approval by the instructor. A written report is required.

FISI 4999. UNDERGRADUATE RESEARCH. One to three credit hours. Prerequisite: authorization of the Director of the Department.

A research project in either basic or applied physics to be supervised by a member of the Department.

Advanced Undergraduate and Graduate Courses

FISI 5025. INTRODUCTION TO SOLID STATE PHYSICS. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisites: FISI 5037 or authorization of the Director of the Department.

An introduction to X-ray diffraction, crystal structures, elastic constant of crystals, lattice energy and vibrations; thermal properties of solids, dielectric properties, ferroelectric crystals; diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism; free electron model of metals, superconductivity, excitons, photoconductivity and luminescense.

FISI 5037. INTRODUCTION TO SOLID STATE PHYSICS. Three credit hours. Three hours of lecture. Corequisites: (FISI 4063 and FISI 4057) or authorization of the Director of the Department.

An introduction to x-ray diffraction, crystal, crystal structures, elastic constants of crystals, lattice energy and vibrations, thermalproperties, ferroelectric crystals, diamagnetism, paramagnetism, ferromagnetism, antiferrogmagnetis, free electron model of metals, superconductivity, excitons, photoconductivity and luminescence.

FISI 5045. PHYSICS OF FLUIDS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009, FISI 3152 and authorization of the Director of the Department.

Hydrostatics, mathematical models of fluid dynamics, dimensional analysis and similitude, boundary layer flow in pipes and ducts, incompressible potential flow.

FISI 5047. LASER PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 4105 and FISI 4068) or authorization of the Director of the Department.

Semi-classical theory of laser operation. Analysis of laser light characteristics, interaction of radiation with matter, optical resonators, pumping schemes, common laser systems, and non-linear optics.

ASTRONOMY

ASTR 3005. DESCRIPTIVE ASTRONOMY. Three credit hours. Three hours of lecture per week. Open only to non-science or non-engineering majors.

A descriptive treatment of the structure of the universe beginning with naked-eye astronomical observations and progressing to telescopic observations and simple interpretations. Topics to be covered include the solar system, stars, stellar systems and galaxies. Occasional observation periods at night or early morning, as determined by the professor.

ASTR 4005. ASTRONOMY I. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 3151 or FISI 3161 or FISI 3171.

A descriptive course covering facts and theories pertaining to the solar system and the sidereal universe.

ASTR 4006. ASTRONOMY II. Three credit hours. Three hours of lecture per week. Prerequisites: ASTR 4005 and (FISI 3152 or FISI 3162 or FISI 3172).

A continuation of ASTR 4005, including an introduction to celestial mechanics and astrophysics.

ASTR 4015. RADIO ASTRONOMY. Three credit hours. Three hours of lecture per week. Prerequisites: ASTR 4006 and (FISI 4020 or FISI 4017).

Study of the fundamentals of radio astronomy, including the spectral and intensity properties of thermal and non-thermal sources, both galactic and extra-galactic. Discussion of galactic sources of radio waves such as supernova remnants and the 21-cm radiation of neutral hydrogen. Analysis of radio pulsars, their use to probe the interstellar medium and their role in gravitational wave detection. Discussion of the basic elements of radio wave reception in single and multiple antenna systems, including the study of radio antenna receivers. Application of basic aspects of processing and analysis of astronomical data.

ASTR 4017. STELLAR EVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisites: ASTR 4006 and FISI 4105.

Discussion of stellar evolution using concepts of thermal physics, nuclear physics, and quantum mechanics. Study of the general properties of stars, matter and radiation under extreme conditions. Analysis of heat transfer processes, thermonuclear fusion and stellar structure.

ASTR 4025. RADIO PULSARS. Three credit hours. Three hours of lecture per week. Prerequisites: ASTR 4006 and FISI 4071.

Discussion of the fundamentals of individual and binary radio pulsars, including normal and millisecond classes using basic observational properties, possible radiation mechanisms involved in generating core and conal radiation, and their total power and polarization. Review of pulsar research and the use of stellar objects as accurate clocks in the study of gravitational waves and as probes of the interstellar medium.

ASTR 4999. UNDERGRADUATE RESEARCH. One to three credit hours. One to three hours of research per week. Prerequisite: authorization of the Director of the Department.

Research project in astronomy or astrophysics to be supervised by a faculty member.

ASTR 5005. FORMATION AND EVOLUTION OF GALAXIES**.** Three credit hours. Three hours of lecture per week.

Formation, types, structures, evolution, and interactions of galaxies.

ASTR 5007. PLANETARY ASTRONOMY.Three credit hours of lecture per week. Prerequisite: ASTR 4005 or authorization of the Director of the Department.

The study of the properties, physical formation, and evolution of the planets and solar system.

METEOROLOGY

METE 3006. EXTREME METEOROLOGICAL PHENOMENA. Three credit hours. Three hours of lecture per week.

Discussion of the most extreme manifestations of weather and climate by analyzing the development and impact of extreme weather events. Analysis of the atmospheric processes that control the weather, and how these processes interact within the context of severe weather events (i.e., hurricanes, ice storms, floods, tornadoes, etc.).

METE 4006. INTRODUCTORY METEOROLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3151 or FISI 3161 or FISI 3171 or FISI 3012.

Elemental study of general meteorology. Principles of thermodynamics, entropy, radiation, state changes and critical temperature.

METE 4007. METEOROLOGICAL MEASUREMENTS. One credit hour. One three-hour laboratory per week. Prerequisite: METE 4006.

Laboratory exercises in measurement of meteorological variables. Meteorological instruments.

METE 4008. PHYSICAL METEOROLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: METE 4006 and MATE 3063.

Radiation, radiation measurements, meteorological optics, atmospheric electricity, and dynamics of the atmosphere.

METE 4057. ATMOSPHERIC THERMODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 3162 or FISI 3172) and MATE 3063.

Discussion of the laws of classical thermodynamics applied to meteorological problems. Topics include relevant state variables, atmospheric composition, equations of state, conservation principles, enthalpy, entropy, thermodynamic diagrams, water phases in the atmosphere, atmospheric stability, and evolution of hydrometeors. Application of these concepts to the study of meteorological phenomena in the tropics and mid-latittudes and to global climatology.

METE 4061. DYNAMIC METEOROLOGY I. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 3162 or FISI 3172) and METE 4006 and MATE 3063.

Discussion of the equations of momentum, continuity, energy conservation, and vorticity applied to the description of fundamental aspects of the meteorology and atmospheric dynamics of middle latitudes and the tropics.

METE 4075. SYNOPTIC METEOROLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: METE 4008 and METE 4057 and METE 4061.

Study of large-scale weather phenomena, analysis and forecasting techniques for mid-latitude and tropical weather. Examination of mid-latitude synoptic events. Analysis of weather maps and data acquired from conventional and remotely sensed sources.

METE 4085. MESOSCALE METEOROLOGY Three credit hours. Three hours of lecture per week. Prerequisite: (METE 4061 and MATE 4009) or authorization of the Director of the Department.

Identification and discussion of the physics of mesoscale atmospheric processes and their computational representation for predictive models. Analysis of the fundamental equations for atmospheric motion, selection of appropriate physical scales, and examination of parameterizations of sub-scale phenomena, such as radiative interactions, convection, and moisture-induced process. Identification of the types of numerical models, their

advantages and disadvantages, and the influence of boundary and initial conditions. Evaluation of atmospheric simulations, and possible applications for mesoscale modeling.

METE 5065. ADVANCED DYNAMIC METEOROLOGY. Three credit hours. Three hours of lecture. Prerequisites: (METE 4061 and MATE 4009) or authorization of the Director of the Department.

Discussion of the quasi-geostrophic approximation, linear perturbation theory, and baroclinic instability to describe atmospheric motion in middle latitudes. Mesoscale phenomena and the general circulation of the atmosphere, variability over tropical latitudes, and principles of numerical modeling for atmospheric motion will be studied.

PHYSICAL SCIENCE

CIFI 3011. PHYSICAL SCIENCE. Three credit hours per semester. Three hours of lecture per week per semester. Corequisite: MATE 3171 or MATE 3173 or MATE 3086 or authorization of the Director of the Department.

To introduce the students to the major concepts which science has formed of the natural world and to provide a balanced and coherent presentation of the more important theories of physical science; to give students an acquaintance with scientific methods, and to show the relationship of science to other fields of knowledge. The major areas cover the solar system, matter, energy, the structure of matter, elementary concepts of geology, and elements of weather. The lectures are supplemented with demonstrations, slides, films, filmstrips, and field trips.

CIFI 3012. PHYSICAL SCIENCE. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: CIFI 3011.

To introduce the students to the major concepts which science has formed of the natural world and to provide a balanced and coherent presentation of the more important theories of physical science; to give students an acquaintance with scientific methods, and to show the relationship of science to other fields of knowledge. The major areas cover the solar system, matter, energy, the structure of matter, elementary concepts of geology, and elements of weather. The lectures are supplemented with demonstrations, slides, films, filmstrips, and field trips.

DEPARTMENT OF PSYCHOLOGY

Undergraduate Courses

PSIC 3001. PRINCIPLES OF PSYCHOLOGY I. Three credit hours. Three hours of lecture per week.

Principles of human behavior, including topics such as: biological bases of behavior, sensation, perception, memory, and learning.

PSIC 3002. PRINCIPLES OF PSYCHOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Principles of human behavior, including topics such as: personality, stress, psychological disorders, and social behavior.

PSIC 3006. SOCIAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

A conceptual and empirical analysis of the behavior, thought, and emotion of individuals in social contexts, including topics such as: social perception, attitudes, and leadership.

PSIC 3015. THEORIES OF PERSONALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Personality analyzed from various psychological perspectives, including psychoanalytic, behavioristic, humanistic, cognitive, and trait theories.

PSIC 3016. ABNORMAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Principal theories and recent research in abnormal psychology; incidence, causes, formation, development, and manifestations of emotional disorders; therapeutic approaches; diagnostic classification. Field trips required.

PSIC 3017. INTRODUCTION TO PSYCHOLOGICAL ASSESSMENT. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002 and (ESMA 3102 or MATE 3102).

Principles and techniques in the construction, selection, administration, and interpretation of major psychological tests, including ethical and social considerations.

PSIC 3018. PHYSIOLOGICAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002 y (CIBI 3032 or BIOL 3052 or (BIOL 3062 and BIOL 3064)).

Introduction to the neuro-physiological bases of behavior the structure, function, and neurochemistry of human and animal models of sensation, perception, motivation, emotion, learning, reproduction, and psychopathology.

PSIC 3025. HUMAN DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002- Principles of Psychology II.

Discussion and analysis of theories, processes and issues related to the physical, social, cognitive and psychological development from conception to death. Study of key issues in the development of the individual within different contexts: individual, family, school and community, from a psychological perspective.

PSIC 3027. CHILDHOOD PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual from the prenatal period to puberty, with special interest in the child's healthy development.

PSIC 3028. PSYCHOLOGY OF ADULTHOOD. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual in adulthood.

PSIC 3035. APPLIED PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Application of psychological knowledge to the solution of problems, emphasizing the following areas: health psychology, legal psychology, environmental psychology, consumer psychology, and sport psychology.

PSIC 3036. EDUCATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Principles of human learning and thinking as applied to the educational environment. Analysis of educational objectives, student characteristics, teaching methods, and learning assessment.

PSIC 3039. PSYCHOLOGY OF ADOLESCENCE. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual from puberty to adulthood.

PSIC 3040. PERSONAL DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Psychological perspectives that facilitate the awareness of the individual's capacity to cope with day-to-day events and challenges.

PSIC 3046. HISTORY AND SYSTEMS OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

History of psychology emphasizing the development of its various systems.

PSIC 3047. COUNSELING PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002.

The function of the helping professional as a facilitator of personal growth, the educational process, and vocational development.

PSIC 3060. ENVIRONMENTAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

The interrelationship between the behavior of the individual and the natural and anthropogenic environment.

PSIC 3070. INTRODUCTION TO COGNITIVE PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Psychological foundations of information processing by the individual.

PSIC 3080. PSYCHOLOGY AS A PROFESSION. Three credit hours. Three hours of lecture per week.

Analysis of various aspects related to the training and practice of psychology as a practitioner, academic or researcher; the laws that regulate the practice of psychology; ethical and legal obligations; and the standards for writing and disseminating scientific knowledge.

PSIC 3117. FOLK HEALING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002.

Analysis of caribbean folk healing systems in terms of their functions, therapeutic elements and antitherapeutic dimensions.

PSIC 3185. PSYCHOSOCIAL ASPECTS OF THE HIV/AIDS EPIDEMIC. Three credit hours. Three hours of lecture per week.

The social and psychological impact of the HIV/AIDS epidemic.

PSIC 4005. INTRODUCTION TO SCHOOL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Introduction to the general principles and notions of school psychology that integrate both theoretical and applied aspects. Historical development of school psychology and the roles and functions of professionals in the field. Presentation and discussion of critical perspectives regarding the importance of school psychology in the promotion

of learning, in prevention programs focused on situations that affect school systems, in the development of intervention based on scientific data, and in their role as support resources in the school community.

PSIC 4006. EXPERIMENTAL METHODS IN PSYCHOLOGY. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: CISO 4042 or ESMA 3102.

Application of experimental and quasi-experimental methods to the problems of psychology, including the design, implementation, analysis, and presentation of a research project.

PSIC 4009. INDUSTRIAL/ ORGANIZATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Identification and analysis of the individual, group and organizational variables which help to explain and predict human behavior in the work setting.

PSIC 4010/EDFI 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Psychological factors involved in motor performance and in sports.

PSIC 4050. QUANTITATIVE RESEARCH IN PSYCHOLOGY. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: ESMA 3015 or ESMA 3101 and 12 credits in PSIC.

Discussion and application of quantitative research methods and designs in the field of psychology.

PSIC 4065. SEMINAR ON PSYCHOLOGICAL RESEARCH. Three credit hours. Three hours of seminar per week. Prerequisites: PSIC 4050 and PSIC 4078.

Planning, design, and implementation of an empirical investigation. An oral presentation and a written report are required.

PSIC 4076. PSYCHOLOGY OF THE INTERNET. Three credit hours. Three hours of lecture per week. Prerequisites: 12 credits in psychology or authorization of the Director of the Department.

Analysis of the psychological implications of internet use, emphasizing themes such as internet addiction, virtual communities, multiple identities, and disinhibited behavior.

PSIC 4078. QUALITATIVE RESEARCH IN PSYCHOLOGY. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisite: PSIC 3006.

Procedures for planning, conducting, and analyzing qualitative research in psychology such as interviews, observation, case studies, life-stories, and content analysis.

PSIC 4086. PRACTICUM IN PSYCHOLOGY. Four credit hours. Two hours of lecture and two two-hour workshops per week. Prerequisite: 15 credits in psychology.

Supervised experiences in service agencies and other community organizations. Field trips required.

PSIC 4088. SPECIAL TOPICS IN PSYCHOLOGY. One to three credit hours. One to three hours of lecture per week.

Selected topics in psychology.

PSIC 4096. ABNORMAL PSYCHOLOGY IN CHILDREN AND ADOLESCENTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Discussion and analysis of the etiologies, evolution, diagnosis and treatment of psychological disorders that are observed in children and adolescents. Emphasis on the study of disorders within the school context and the evaluation of effective psychoeducational interventions.

PSIC 4116. PSYCHOLOGY OF HUMAN SEXUALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Human sexuality from a psychosocial perspective.

PSIC/SOCI/CIPO 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: 12 credit hours in psychology or sociology or political science, respectively, and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

PSIC/SOCI/CIPO 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSIC 4991 or SOCI 4991 or CIPO 4991, respectively, and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

Advanced Undergraduate Course

PSIC 5016. ANALYTICAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: 12 credit hours in psychology or authorization of the Director of the Department.

Fundamental concepts of Jungian psychology applied to personality, psychotherapy, and religion.

PSIC 5017. PSYCHOLOGY OF HUMAN DIVERSITY. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3006 or authorization of the Director of the Department.

Study and discussion of human diversity, including race, ethnicity, social class, gender, religious identity, sexual orientation, and physical, intellectual, and communication disabilities. Analysis of the effects of "being different" from a psycho-social perspective. Evaluation of strategies at the social, family, and educational levels to raise consciousness about prejudice and discrimination. The course will also discuss the historical processes that affect identity, as well as the formation of stereotypes, prejudices and discrimination at an individual and systemic level in the colonial context of Puerto Rico. The course may be taught in hybrid modality.

DEPARTMENT OF SOCIAL SCIENCES

Undergraduate Courses

ANTHROPOLOGY

ANTR 3005. INTRODUCTION TO CULTURAL ANTHROPOLOGY. Three credit hours. Three hours of lecture per week.

General introduction to cultural anthropology's main concepts, methods and subfields. Define the discipline's objectives and situate anthropology's emergence in relation to the history of Europe's colonial expansion. Examine our human diversity and its ethnic, political, economic, technological, familiar and religious manifestations, among others. Understand socio-cultural change processes in a global context.

ANTR 3015. INTRODUCTION TO PHYSICAL ANTHROPOLOGY. Three credit hours. Three hours of lecture per week.

Concepts of biological and cultural evolution, mechanisms of evolution, the evolutionary history of the human being, the fossil record, socioeconomic adaptations in prehistory.

ANTR/CISO 4066. POLITICAL AND CULTURAL ASPECTS OF INDIGENOUS PEOPLES OF LATIN AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3121 o ANTR 3005.

Indigenous peoples of Latin America: culture areas; history; "indigenismo" and identity; political, economic, and civil rights.

ANTR 4007. CULTURE AND ENERGY. Three credit hours. Three hours of lecture per week. Prerequisites: ANTR 3005 or SOCI 3007 or GEOG 3155.

Study of the cultural and social dimensions of energy consumption and various energy technologies. Discussion of the social and environmental impact of energy consumption and its relationship with production and distribution as well as energy policies and social struggles related to energy.

GEOGRAPHY

GEOG 3155. HUMAN GEOGRAPHY. Three credit hours. Three hours of lecture per week.

Introduction to human geography, its main areas of study and basic related concepts. Examination of geographic distribution as well as the factors and processes associated with geography of population, migration, political and cultural geography, development and globalization. Discussion of the interaction between humans, society and the environment together with the presentation of the most widely used research techniques.

GEOG 3185. PHYSICAL GEOGRAPHY. Three credit hours. Three hours of lecture per week.

Spatial description of the different systems that make up the planet Earth and the interaction among them, with emphasis on the study of the processes and factors associated with elements of the earth's surface, climate and ecosystems at different scales. Discussion of the relationship among humankind, physical environment, and human adaptability to different environments, as well as the most commonly used research techniques.

GEOG 4106. GEOGRAPHIC INFORMATION SYSTEMS (GIS) FOR THE SOCIAL SCIENCES. Three credit hours. One hour of lecture and two hours of workshop per week. Prerequisites: SOCI 3265 or CISO 3266 or CISO 4117 or CIPO 4145 or HIST 4226 or authorization of the Director of the Department.

Critical discussion and application of GIS in applied social research together with other data collection techniques an analysis in social research.

HISTORY

HIST 3091. HISTORY OF FRANCE. Three credit hours. Three hours of lecture per week.

An intensive study of the history of France from its origins to 1789 with special emphasis on the religious wars, the Enlightenment, and the French Revolution.

HIST 3092. HISTORY OF FRANCE. Three credit hours. Three hours of lecture per week.

The political, economic and constitutional history of France from 1789 to the present with emphasis on the effects of the French Revolution upon the history of the country; origins and fall of the Third Republic; Charles De Gaulle's regime.

HIST 3111. HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

Historical development of the United States of America from the colonial period to the Civil War.

HIST 3112. HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

Historical development of the United States of America from the reconstruction period to the present, with emphasis on the impact of economic and social forces on national policies.

HIST 3121. HISTORY OF THE FOREIGN POLICY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

The development of American foreign policy from 1775 to the present, within the context of the changing patterns of American interests and those of the world, as foreign relations grow in complexity and significance.

HIST 3122. HISTORY OF THE FOREIGN POLICY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

The development of American foreign policy from 1775 to the present, within the context of the changing patterns of American interests and those of the world, as foreign relations grow in complexity and significance.

HIST 3141. HISTORY OF SPAIN I. Three credit hours. Three hours of lecture per week.

Cultural influence of the various people that settled the Iberian Peninsula on the history and civilization of the different Spanish Kingdoms from the beginning to the period of national unity under Ferdinand and Isabella.

HIST 3142. HISTORY OF SPAIN II. Three credit hours. Three hours of lecture per week.

The evolution of the Spanish Empire and the causes leading to its downfall; analysis of the cultural, social and political development of Spain from the 16th Century to the present.

HIST 3155. HISTORY OF NINETEENTH CENTURY EUROPE. Three credit hours. Three hours of lecture per week.

Development of the major European countries, and their international relations within Europe. Emphasis will be given to nationalism, imperialism, and their impact upon Europe and the non-European world.

HIST 3158. HISTORY OF TWENTIETH CENTURY EUROPE. Three credit hours. Three hours of lecture per week.

Development of the major European countries, and their international relations within Europe. Emphasis will be given to the First World War, the Peace Conferences, the rise of Fascism and National Socialism, the Second World War, and the Reconstruction of Europe.

HIST 3165. HISTORY OF THE RENAISSANCE. Three credit hours. Three hours of lecture per week.

A study of the transition from medieval times to modern civilization in Western Europe; origin and development of the Renaissance; the Protestant and Catholic reformations.

HIST 3185. THE MEDIEVAL WORLD. Three credit hours. Three hours of lecture per week.

The history of Europe from the collapse of the Roman Empire in the West to the Renaissance.

HIST 3195. HISTORY OF THE ANCIENT WORLD. Three credit hours. Three hours of lecture per week.

The origins of mankind; the civilization of the Near East, India and China; the rise and decline of the Greek and Roman cultures.

HIST 3201. HISTORY OF THE MODERN WORLD I. Three credit hours. Three hours of lecture per week.

Study of the political, socio-cultural, economic and religious development of the World from 1500 to 1815.

HIST 3202. MODERN WORLD HISTORY II. Three credit hours. Three hours of lecture per week.

The contemporary world from the Congress of Vienna to the present, with emphasis on the First and Second World Wars, the Cold War and the Third World.

HIST 3211. HISTORY OF LATIN AMERICA. Three credit hours. Three hours of lecture per week.

The historical development of Latin America from its origins to the wars of independence, with emphasis on the Spanish Conquest and the development of the colonial society.

HIST 3212. HISTORY OF LATIN AMERICA. Three credit hours. Three hours of lecture per week.

History of Latin America from the national period to the present, with emphasis on its economic, social and political development.

HIST 3221. HISTORY OF THE ANTILLES. Three credit hours. Three hours of lecture per week.

A comparative study of the historical development in the Antilles of Spanish, English, French and Dutch colonial institutions through the 18th century.

HIST 3222. HISTORY OF THE ANTILLES. Three credit hours. Three hours of lecture per week.

A comparative study of the social, economic and political development of the Antilles in the 19th and 20th centuries.

HIST 3241. HISTORY OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of Puerto Rico from the discovery and colonization to the middle of the nineteenth century.

HIST 3242. HISTORY OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of Puerto Rico from the second half of the nineteenth century to the present.

HIST 4005. HISTORY OF MEXICO. Three credit hours. Three hours of lecture per week.

History of Mexico from Pre-Colombian times to the present; the political, social, cultural, and economic development of the country.

HIST 4055. THEMES IN EUROPEAN HISTORY. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 3201 or 3202.

Advanced study of the most significant movements in modern European history, readings, research, and report writing.

HIST 4066. THEMES IN THE HISTORY OF THE AMERICAS. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 3111 or HIST 3112 or HIST 3211 or HIST 3212.

Advanced study of the most significant movements in the historical development of the Americas, readings, research, and report writing.

HIST 4075. SPECIAL PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Under the guidance of a member of the staff, the student will be required to organize and carry out a project of historical research.

HIST 4111. SOCIAL HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

A history of the development of the American people from early colonial days to the present. The expansion and changes in the general patterns of living, thinking and culture will be covered, with emphasis on economic and political factors.

HIST 4112. SOCIAL HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

A history of the development of the American people from early colonial days to the present. The expansion and changes in the general patterns of living, thinking and culture will be covered, with emphasis on economic and political factors. Prerequisite: HIST 4111.

HIST 4117. HISTORY OF LABOR IN THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

The development of the patterns and institutions of labor in the United States of America from colonial times to the present, with emphasis on the post-Civil War period. Includes discussions on indentured servitude, slavery and the development of free labor, the origins and development of unionism, and the labor-oriented theories of social reform.

HIST 4165. HISTORY OF BRAZIL. Three credit hours. Three hours of lecture per week.

A historical survey of Brazil through the colonial and national periods, with special attention to economic, social and political development, cultural conflicts, and foreign relations.

HIST 4171. HISTORY OF RUSSIA. Three credit hours. Three hours of lecture per week.

Study of Russian history from its origins to the reign of Peter the Great.

HIST 4172. HISTORY OF RUSSIA NINETEENTH CENTURY. Three credit hours. Three hours of lecture per week.

Introductory course on the History of Russia since the reign of Alexander I to the present, from a political and economic standpoint. Includes analysis of primary sources and readings of well known researchers to discuss local affairs as well as international relations. Emphasis can be given to the Nineteenth or Twentieth Century, according to the readings selected.

HIST 4220. HISTORY OF GERMANY SINCE 1871. Three credit hours. Three hours of lecture per week.

History of Germany emphasizing the period from its unification in 1871 to the present.

HIST 4221. HISTORIOGRAPHY AND APPROACHES TO HISTORY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: HIST 3202.

A study of the methods and techniques of historical research; a survey of the development of History as a discipline; and an analysis of the theories, approaches and contributions of the most noted modern historians.

HIST 4222. HISTORIOGRAPHY AND APPROACHES TO HISTORY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: HIST 4221.

A study of the methods and techniques of historical research; a survey of the development of History as a discipline; and an analysis of the theories, approaches and contributions of the most noted modern historians.

HIST 4226. HISTORICAL RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: Twelve credit hours in History and authorization of the Director of the Department.

A study of the methods in historical research and of the most important historical currents, with the purpose of preparing the student to make intensive studies in his major field.

HIST 4228. THEMES IN HISTORY. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 4226.

Lectures and directed readings on selected topics.

HIST 4235. REVOLUTIONS IN TWENTIETH CENTURY LATIN AMERICA. Three credit hours. Three hours of lecture per week.

Comparative historical analysis of the origins and development of Latin American revolutions in the 20th Century, with emphasis on the nature and direction of social change attendant to revolutions in Mexico, Bolivia, Cuba and Chile.

HIST 4345. TWENTIETH CENTURY PUERTO RICAN HISTORY. Three credit hours. Three hours of lecture per week.

The historical development of Puerto Rico in the twentieth century: constitutional history, political movements, economic development, and socio-cultural changes.

POLITICAL SCIENCES

CIPO 3011. PRINCIPLES AND PROBLEMS OF POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week.

Introduction to basic concepts and differing perspectives of Political Science. Analysis of ideologies, government systems, elections and political parties in the global, comparative as well as the local context. Overview of interest groups, social movements, international relations and political economy.

CIPO 3025. POLITICAL SYSTEM OF THE UNITED STATES. Three credit hours. Three hours of lecture per week.

A study of the historical background of the American government including the framing of its constitution and the political theory on which the American system of government is based. An analysis of the structure of that government at the national level and its political process with emphasis on separation of powers, federalism and the functions of interest groups and political parties, among other actors.

CIPO/CISO 3026. INTRODUCTION TO PUBLIC POLICY ANALYSIS. Three credit hours. Three hours of lecture per week.

Identification and study of state institutions and civil society with respect to their role as stakeholders in the establishment of public policy. Discussion of the process of creating public policy including issue definition, agenda establishment, formulation and adoption of said policy, program implementation and methods of evaluation.

CIPO/CISO 3027. CITIZEN PARTICIPATION IN PUBLIC DECISION-MAKING. Three credit hours. Three hours of lecture per week.

Study of citizen participation and its role in planning and public decision-making. Analysis of current participation strategies with emphasis on effective citizen participation in public decision-making at the state and federal levels. In addition, theoretical administrative, sociopolitical and scientific fundamentals of citizen participation will be explored. Case studies concerning the location of infrastructural projects, managing natural resources and environmental protection will be discussed.

CIPO/CISO 3985. LEGISLATIVE INTERNSHIP IN PUERTO RICO. Six credit hours. A minimum of seven and a half hours per week of practice for fifteen weeks during the semester. Prerequisite: authorization of the Director of the Department.

Practical experience in the making of public policy and the legislative process within a legislator's office, any of the secretaries of the Senate or House of Representatives, or any commission or research office.

CIPO 3035. GOVERNMENT OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

Historical and analytical survey of the Government of Puerto Rico from 1898 to the present; governmental institutions developed during United States rule, 1898-1952; the Constitution of the Commonwealth of Puerto Rico; the political process in Puerto Rico; the Legislature, the Executive, the Judiciary, local governments, and relations between Puerto Rico and the United States of America.

CIPO 3045. INTERNATIONAL ORGANIZATION AND ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

A study and analysis of the functional as well as the constitutional bases of international organization and administration, with emphasis on the dynamics and functions of the United Nations.

CIPO 3065. INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Analysis of concepts and theories of international relations within the international system from a historical and contemporary perspective. Emphasis on continuity and change, the role of international organizations, globalization, terrorism, the prospects for peace in the 21st century and foreign policy decision-making at the different levels of analysis.

CIPO 3095. MUNICIPAL GOVERNMENT. Three credit hours. Three hours of lecture per week.

Historical and legal background, organization, and functions of the municipal system. Emphasis on the municipal governments of Puerto Rico.

CIPO 3175. INTRODUCTION TO LAW. Three credit hours. Three hours of lecture per week.

Principal theories and rules in Law including those of the United States and Puerto Rico; the history of Law and the most common research methods in the field.

CIPO 4005. CONSTITUTIONAL LAW. Three credit hours. Three hours of lecture per week.

A study of the constitutional design of the government of the United States and its application to Puerto Rico through the analysis of cases of the Supreme Courts of the U.S. and Puerto Rico. It exposes the student to the criteria of judiciability and topics such as judicial review, separation of powers, the territories clause, constitutional amendments, among others.

CIPO 4015. COMPARATIVE GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

A study of various major political systems; discussion of current theoretical approaches to comparative political analysis. Designed to give the student a general picture of the political process and governmental institutions.

CIPO 4016. GOVERNMENT AND POLITICS OF THE MIDDLE EAST. Three credit hours. Three hours of lecture per week.

Historical and analytical study of the political development in Middle Eastern countries. It includes Arab and non-Arab states such as Israel and Iran. The Arab-Israeli Wars and the Oslo process are discussed as well as recent developments in the region.

CIPO 4017. THE EUROPEAN UNION IN INTERNATIONAL LAW AND DIPLOMACY. Three credit hours. Three hours of lecture per week.

Analysis of the European Union as a legal and political community and study of EU law. Explanation of the structure, functions and legal personality as well as its evolution in International Law. Discussion of diplomatic implications and the capacity to engage in relations with diverse subjects in the international system, culminating in the European Union Common Security and Foreign Policy (CSFP).

CIPO 4025. PUBLIC OPINION. Three credit hours. Three hours of lecture per week.

Analysis of the factors influencing the formation of citizens' opinions. Emphasis on the impact of mass media communications of public affairs. Discourse analysis, surveys, polling, and their relationship to election campaigns and other issues of public interest. It explores the interactions between civil society and the political elite from a multidimensional cognitive and affective perspective.

CIPO 4035. POLITICAL PARTIES. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

The nature and functions of political parties: origin, development, structure, economics and composition, internal management and controls; the relation of political parties and pressure groups to legislation and administration.

CIPO 4045. ELEMENTS OF PUBLIC ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

The role of public administration in modern society; principles of organization, budgeting, management techniques, the public service, and the control of administration.

CIPO 4046. SPECIAL TOPICS IN POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Research of selected topics in Political Science.

CIPO 4051. POLITICAL THEORY. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: CIPO 3011.

Systematic and critical exposition of political thought from the beginning of history to modern times. Political doctrines such as democracy, liberalism, socialism and communism will be analyzed. Emphasis will be given to comparison of different political beliefs, and also to the relationships between the different theories, considered as historic heritage which contribute to contemporary circumstances.

CIPO 4052. POLITICAL THEORY. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: CIPO 4051.

Systematic and critical exposition of political thought from the beginning of history to modern times. Political doctrines such as democracy, liberalism, socialism and communism will be analyzed. Emphasis will be given to comparison of different political beliefs, and also to the relationships between the different theories, considered as historic heritage which contribute to contemporary circumstances.

CIPO 4056. INTRODUCTION TO CRIMINAL LAW. Three credit hours. Three hours of lecture per week.

Introduction to the general principles, as well as the elements which constitute crimes according to Puerto Rico's Criminal Code.

CIPO 4065. INTERNATIONAL LAW. Three credit hours. Three hours of lecture per week.

Study of the legal relations among states and other international subjects such as international organizations.

CIPO 4085. AMERICAN FOREIGN POLITICY. Three credit hours. Three hours of lecture per week. Prerequisites: CIPO 3011 or CIPO 3025.

An outline of the modern policy of the United States of America, how it is formulated, the relationship between the American democratic processes and the demands of a global foreign policy, and the basic factors shaping it.

CIPO 4095. GOVERNMENT AND POLITICS OF THE CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Study and analysis of the government, political processes and political groups in the Caribbean area, including their relations with outside countries.

CIPO 4105. LATIN AMERICAN GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Latin American parties and politics; governmental activities and problems, the structure of government. Emphasis is placed on political realities rather than on formal constitutional provisions.

CIPO 4115. LATIN AMERICAN INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week.

Survey of relations among Latin American states and with North America, Europe and Asia. Analysis of Latin America's integration processes and participation in international institutions.

CIPO 4127. GLOBALIZATION AND WORLD POLITICS. Three credit hours. Three hours of lecture per week.

The impact of globalization on contemporary world politics. Topics include, among others: the crisis of the capitalist state, the Great Depression, imperialism, regional blocks, and the new economic world order.

CIPO 4145. RESEARCH METHODS IN POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: 12 credits in Political Science and ESMA 3015 or ESMA 3101.

Quantitative and qualitative research methods in Political Science. Emphasis on the development of research questions, justification, literature reviews, theoretical framework, concepts, variables, hypotheses, measurement, and research designs. The presentation of oral and written reports and the preparation of a research proposal are required.

CIPO 4155. RESEARCH SEMINAR IN POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 4145.

Application of theories and research methods to Political Science. A scientific, structured and systematic research project is required. Presentation of oral and written reports related to the dissemination of results is also required.

CIPO 4236. REVOLUTIONS IN TWENTIETH CENTURY LATIN AMERICA. Three credit hours. Three hours of lecture per week.

Comparative historical analysis of the origins and development of Latin American revolutions in the 20th Century, with emphasis on the nature and direction of social change attendant to revolutions in Mexico, Bolivia, Cuba and Chile.

CIPO 4735. UNITED NATIONS MODEL. Five credit hours. Three hours of lecture per week and a United Nations trip.
Study and participation in the Model United Nations through the simulation of the proceedings of the UN. This simulation will be accomplished through the representation of an assigned role on different UN committees. This participation requires travel to the Model UN in New York.

CIPO/PSIC/SOCI/CISO 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: CIPO 4991: 12 credits in CIPO and authorization of the Director of the Department. PSIC 4991: 12 credits in PSIC and authorization of the Director of the Department. SOCI 4991: 12 credits in SOCI and authorization of the Director of the Department. CISO 4991: 12 credits in CISO and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

CIPO/PSIC/SOCI/CISO 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: CIPO 4992: CIPO 4991 and authorization of the Director of the Department. PSIC 4992: PSIC 4991 and authorization of the Director of the Department. SOCI 4992: SOCI 4991 and authorization of the Director of the Department. CISO 4992: CISO 4991 and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

SOCIAL SCIENCES

Undergraduate Courses

CISO 3017. INTRODUCTION TO MASCULINITY STUDIES. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Introduction to the study of masculinities from a social constructionism perspective. Critical analysis of the current social patriarchal structures as hegemonic factor in the construction of the masculine gender and the different

masculinities social expressions. Examination of how social structures facilitate the construction of a masculine gender antagonist to the feminine gender.

CISO/CIPO 3026. INTRODUCTION TO PUBLIC POLICY ANALYSIS. Three credit hours. Three hours of lecture per week.

Identification and study of state institutions and civil society with respect to their role as stakeholders in the establishment of public policy. Discussion of the process of creating public policy including issue definition, agenda establishment, formulation and adoption of said policy, program implementation and methods of evaluation.

CISO/CIPO 3027. CITIZEN PARTICIPATION IN PUBLIC DECISION-MAKING. Three credit hours. Three hours of lecture per week.

Study of citizen participation and its role in planning and public decision-making. Analysis of current participation strategies with emphasis on effective citizen participation in public decision-making at the state and federal levels. In addition, theoretical administrative, sociopolitical and scientific fundamentals of citizen participation will be explored. Case studies concerning the location of infrastructural projects, managing natural resources and environmental protection will be discussed.

CISO 3031. COMMUNITY ORGANIZATION AND TRANSFORMATION I. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Analysis of the critical community work processes and social solidarity transformation in the Puerto Rican context. Study of the methods, techniques and strategies of community organization and transformation.

CISO 3032. COMMUNITY ORGANIZATION AND TRANSFORMATION II. Three credit hours. Five hours of field work (practice) and one hour of discussion per week. Prerequisite: CISO 3031.

Creation and organization of projects for community transformation, under the supervision and coordination of the University Institute for Community Development. It requires filedwork in groups.

CISO 3041. GENDER VIOLENCE I: THEORETICAL PERSPECTIVES, PUBLIC POLICIES AND SERVICES. Three credit hours. Three hours of lecture per week.

Introduction to the theoretical foundations of the manifestations of gender violence, public policies and services available to the affected populations.

CISO 3042. GENDER VIOLENCE II: METHODOLOGICAL PERSPECTIVES, EXPERIENCES AND LEARNING. Three credit hours. Five hours of practice and one hour of assessment meeting with the professor per week. Prerequisite: CISO 3041.

This course prepares students to know the individual, group or family approaches to work with survivors of gender violence (domestic violence, violence in relationships, sexual assault and harassment, among others). Students will apply the knowledge to practical experiences of individual, family or group intervention with victims/survivors within the UPR Mayagüez Campus' Siempre Vivas Program, and education projects within the community.

CISO/CIPO 3985. LEGISLATIVE INTERNSHIP IN PUERTO RICO. Six credit hours. A minimum of seven and a half hours per week of practice for fifteen weeks during the semester. Prerequisite: authorization of the Director of the Department.

Practical experience in the making of public policy and the legislative process within a legislator's office, any of the secretaries of the Senate or House of Representatives, or any commission or research office.

CISO 3121. AN INTRODUCTION TO THE STUDY OF THE SOCIAL SCIENCES. Three credit hours per semester. Three hours of lecture per week each semester.

This course is directed toward a better understanding of the social forces that have produced the world in which we live. It introduces the student to the basic problems of man in contemporary society, such as the incorporation of the individual in society, population pressure, wealth and freedom.

CISO 3122. AN INTRODUCTION TO THE STUDY OF THE SOCIAL SCIENCES. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: CISO 3121.

This course is directed toward a better understanding of the social forces that have produced the world in which we live. It introduces the student to the basic problems of man in contemporary society, such as the incorporation of the individual in society, population pressure, wealth and freedom.

CISO 3126. CULTURAL DIVERSITY. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week.

Introduction to the concept of cultural diversity from a multi and interdisciplinary perspective. The concept of cultural diversity will be examined from a variety of disciplines including: sociology, anthropology, psychology, education, public health, social work, and sociolinguistic.

CISO 3127. SEXUAL DIVERSITY AND THE PUERTO RICAN SOCIETY. Three credit hours. One hour of lecture and two hours of discussion per week.

Study of sexual orientation and identity as explained by different scientific and social theories. Students will be exposed to the scientific framework as well as the human rights perspective of sexual orientation categories (heterosexual-bisexual-homosexual) and sexual identity categories (straight, gay, lesbian, transgender, transsexual) and the social and civic responsibility we owe this population due to its major visibility.

CISO 3145. BIBLIOGRAPHY AND LIBRARY RESEARCH IN THE SOCIAL SCIENCES. Three credit hours. Three hours of lecture per week.

Introduction to the uses of the library: the card catalogue, periodical, indexes, encyclopedias, dictionaries, and other reference reports, and term papers in the social sciences.

CISO 3266/SOCI 3265. QUANTITATIVE RESEARCH METHODS IN THE SOCIAL SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisites: (SOCI 3262 or CISO 3122) and ESMA 3015.

Critical discussion of the basic concepts and techniques of quantitative research in social sciences. Design and application of different components of quantitative research: problem formulation and research questions, sampling, data gathering and analysis, and finding reports. A research proposal will be prepared and submitted.

CISO 3286/SOCI 3285. DYNAMICS AND PROCESSES OF GROUPS. Three credit hours. Three hours of lecture per week.

Study of the theories that explain interpersonal behavior within the context of the group. Emphasis on the dynamics and processes related to the development of social identity as a result of belonging to a group. Introduction to the group as a promoter of change in individuals and the factors which interact in support and counseling groups.

CISO 4008. THEORETICAL FOUNDATIONS IN THE SOCIAL SCIENCES. Three credit hours. One hour of lecture and two hours of discussion per week. Prerequisite: CISO 3122.

Introduction to contemporary theoretical frameworks from the social sciences which are essential for the discussion of current issues and problems.

CISO 4056. PSYCHO-SOCIAL ASPECTS OF GENDER. Three credit hours. Three hours of lecture per week.

Discussion of psychosocial aspects of gender and elements inherent to its deconstruction from feminist perspectives.

CISO/ANTR 4066. POLITICAL AND CULTURAL ASPECTS OF INDIGENOUS. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3121 or ANTR 3005.

Indigenous peoples of Latin America: culture areas; history, "indigenismo," and identity; political, economic, and civil rights.

CISO 4096. PRINCIPLES OF SOCIAL WORK. Three credit hours. Three hours of lecture per week.

Presentation of the basic principles of social work as they are illustrated in case studies of groups and of the community. The student will become acquainted with the work of the social service agencies in Puerto Rico.

CISO 4116. HUMAN NEEDS AND WELFARE. Three credit hours. Three hours of lecture per week.

A critical analysis of how the state has responded to human needs starting with the historical development of social welfare systems in different contexts. Exposition to different theoretical perspectives and to different possible solutions to social problems and situations which guide the available programs and services within the Puerto Rican social context.

CISO 4117. FIELD WORK TECHNIQUES. Three credit hours. Three hours of lecture per week.

Strategies and techniques to work at different situations in governmental agencies and non governmental organizations, as it's related to social welfare will be studied. The observation, interview and qualitative analysis techniques are applied in field work and through individual and group interventions.

CISO 4118. INTERVENTION STRATEGIES WITH FAMILIES. Three credit hours. Three hours of lecture per week.

Will study approaches and techniques toward the work with families as a human group and with their integrant as individuals. All helping process requires skills in the design and implementation of strategies for facilitating change in the family members. Transforming the family members relationships. The course will expose students to the different theoretical perspectives most used in the work with families. Recent research about the most common problems confronted by families and the strategies to work with it in today's Puerto Rico will be discussed.

CISO 4119. INTRODUCTION TO MEDIATION AND NON-VIOLENT MANAGEMENT OF CONFLICTS. Three credit hours. Three hours of lecture per week.

Mediation is presented as one of the alternative non adversarial and non-violent ways of conflicts resolution. The role of mediation in resolving conflicts and disputes, be them pertaining to families, commerce, the workplace, or the international arena, among others, is examined. Mediation theories, principles and skills are incorporated, and students are provided with opportunities to practice said skills. Current research involving mediation is also discussed, and the way mediation is regulated in Puerto Rico is explained. Other conflict management methods, such as negotiation, facilitation, and arbitration are described.

CISO 4120. HUMAN WELFARE SEMINAR. Three credit hours. Three hours of seminar per week. Co-requisites: CISO 4116 or CISO 4117 or CISO 4118 or CISO 4119.

Planning and development of a research or an intervention program/project that promotes human wellness. A research or project proposal, a final written paper and an oral presentation are required.

CISO 4146/SOCI 4145. SOCIAL PLANNING. Three credit hours. Three hours of lecture per week.

A comprehensive analysis of the principles of social planning and the special problems inherent to planning in a democratic society.

SOCIOLOGY

SOCI 3007. ENVIROMENTAL SOCIOLOGY. Three credit hours. Three hours of lecture per week.

Study of the relationship between humans and the environment with emphasis on the social factors that affect it. Discussion of environmental law and public policy, environmental justice and environmental movements from a Puerto Rican and global perspective. Analysis of the decision-making process at the governmental, group and individual levels with respect to natural resources and the environment in general.

SOCI 3010. SOCIAL ASPECTS OF CLIMATE CHANGE. Three credit hours. Three hours of lecture per week.

Introduction to the study of climate change from a social perspective, its impacts and possible solutions. Discussion of aspects related to values, assumptions and perceptions associated with climatic changes. Critical examination of different points of view and discourses associated with climate change. Analysis of processes related to the human drivers of climate change, inequality, vulnerability, adaptability and mitigation to their possible effects, both current and projected. The study of islands is emphasized, with particular interest to the Caribbean region.

SOCI 3016. SOCIOLOGY OF HEALTH. Three credit hours. Three hours of lecture per week.

Social problems and variables related to health delivery systems; structure and functions of health services.

SOCI 3047. SOCIOLOGY OF RELIGION. Three credit hours. Three hours of lecture per week.

Bases of the religious phenomenon; social functions; organizational phases; religion in preliterate and civilized societies.

SOCI 3261. INTRODUCTION TO SOCIOLOGY I. Three credit hours. Three hours of lecture per week.

Methods and basic concepts in sociology. Relations of the individual with society; social inequality.

SOCI 3262. INTRODUCTION TO SOCIOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3261.

Study of basic social institutions, processes of social change, and collective behavior.

SOCI 3265/CISO 3266. QUANTITATIVE RESEARCH METHODS IN THE SOCIAL SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisites: (SOCI 3262 or CISO 3122) and ESMA 3015.

Critical discussion of the basic concepts and techniques of quantitative research in social sciences. Design and application of different components of quantitative research: problem formulation and research questions, sampling, data gathering and analysis, and finding reports. A research proposal will be prepared and submitted.

SOCI 3276. SOCIOLOGICAL WRITING AND DOCUMENTATION. Three credit hours. Three hours of lecture per week. Prerequisites: SOCI 3262 or CISO 3122.

Discussion of the different elements associated with writing and documenting in sociology. Emphasis on the identification of different types of sociological writing and the use of different sources of information, databases and writing styles in the discipline. Review and evaluation of documents used in social research; writing annotated bibliographies and literature reviews. Practice of document citation, construction of theoretical frameworks and writing research problems and questions.

SOCI 3285/CISO 3286. DYNAMICS AND PROCESSES OF GROUPS. Three credit hours. Three hours of lecture per week.

Study of the theories that explain interpersonal behavior within the context of the group. Emphasis on the dynamics and processes related to the development of social identity as a result of belonging to a group. Introduction to the group as a promoter of change in individuals and the factors which interact in support and counseling groups.

SOCI 3295. HISTORY OF SOCIAL THOUGHT. Three credit hours. Three hours of lecture per week.

Detailed analysis of the history of social thought from antiquity to 19th Century Europe.

SOCI 3305. PRINCIPLES OF POPULATION. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CISO 3122.

An introduction to theories, concepts, and aspects related to population.

SOCI 3315. MARRIAGE AND THE FAMILY. Three credit hours. Three hours of lecture per week.

The development of the family from primitive to modern times. Special attention is given to the problems confronting the modern family, including those of the Puerto Rican family.

SOCI 3325. URBAN SOCIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122 or SOCI 3262 or PSIC 3002.

Study of the theoretical formulation of urban life, with emphasis on the process of urban growth; discussion of topics such as social structure and function of the modern city, ecology, integration between city and country, urban personality, and social aspects of urban renewal.

SOCI 3337. JUVENILE DELINQUENCY. Three credit hours. Three hours of lecture per week.

Juvenille delinquency as a social phenomenon: its nature, causes, prevention, and treatment. The role of government and community agencies.

SOCI 3345. SOCIAL ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisites: CISO 3121 or SOCI 3261 or PSIC 3002 or ANTR 3015 or ECON 3021 or HIST 3202.

Discussion of major theories of social structure, change, adjustment and social disorganization.

SOCI 3355. SOCIETY AND CULTURE IN LATIN AMERICA AND THE CARIBBEAN. Three credit hours. Three hours of lecture per week.

Introduction to the study of Latin America and the Caribbean. Examines its colonial and postcolonial history, including its political transitions, economic models, racial and ethnic diversity and social-cultural change. Analyzes the creolization of European, African and indigenous institutions, practices and ideas including languages, religions, musical genres, cuisines, and political ideologies. Discusses globalization, and its impact on the region: social movements, migrations and diasporas.

SOCI/EDFI 4000. SOCIOLOGICAL FUNDAMENTALS OF RECREATION AND SPORTS. Three credit hours. Three hours of lecture per week.

The interaction among society, sports, and recreation.

SOCI 4006. SPECIAL TOPICS IN SOCIOLOGY. Three credit hours. Three hours of lecture per week.

This course highlights special topics in the field of sociology. The thematic content of this course will vary according to the specialty and interests of professors teaching the course and the needs of students.

SOCI 4017. ENVIRONMENTAL ISSUES IN PUERTO RICO. Three credit hours. Prerequisites: (SOCI 3007 and CISO/CIPO 3026) or authorization of the Director of the Department.

Application of the theoretical and methodological foundations in environmental sociology and policy analysis to the study of environmental issues in contemporary Puerto Rico. Research on a topic in order to prepare a policy briefing which includes courses of action for the sustainable resolution of an environmental issue.

SOCI 4027. ENVIRONMENTAL INEQUALITY. Three credit hours. Three hours of lecture per week. Prerequisites: SOCI 3262 or SOCI 3007 or GEOG 3155.

Study of the relationship between environmental quality and social differentiations, with emphasis on unequal access to a healthy environment and control over environmental resources.

SOCI 4101. CRIMINOLOGY. Three credit hours per week.

Basic terminology; the legal, sociological and cultural aspects of criminality; factors determining delinquency; psychological and psychophysical aspects of crime; classification of crimes, and penology.

SOCI 4115. CONTEMPORARY SOCIAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262.

Consideration of major themes in theory and methodology of selected areas of specialization within sociology and related disciplines.

SOCI 4125. PUERTO RICAN SOCIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: SOCI 3262 or PSIC 3002 or CIPO 3011 or ANTR 3015.

A comprehensive course on the structures, institutions, processes and social, political, economic and cultural changes of Puerto Rican society from a sociological perspective. It examines aspects of Puerto Rico's historical and contemporary reality using such categories as social class, gender, race, family, national identity, religion, population processes, land use, social movements, among others.

SOCI 4145/CISO 4146. SOCIAL PLANNING. Three credit hours. Three hours of lecture per week.

A comprehensive analysis of the principles of social planning and the special problems inherent to planning in a democratic society.

SOCI 4155. SOCIAL AND CULTURAL CHANGE. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CIPO 3011 or ANTR 3015.

An examination of the basic sociological principles of social change. The major points of view will be presented, and data will be used from the fields of anthropology, sociology, psychology and history. Special attention will be given to problems of cultural contact and several specific areas of change which involve fundamental social institutions.

SOCI 4157. TECHNOLOGY AND SOCIETY. Three credit hours. Three hours of lecture per week.

Study of the interrelationship of technology and society, emphasizing its interdependency and how technology and society influence each other. Exploration of the social construction of technology, technological controversies and social, political, economic and cultural factors that impact technological change and vice versa.

SOCI 4165. SOCIAL PROBLEMS IN THE CONTEMPORARY WORLD. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3265.

Discussion and special reports on theoretical and methodological approaches to human group behavior, with emphasis on acquainting the student with the work of social agencies. Participation in an original research project is required.

SOCI 4206. QUALITATIVE RESEARCH METHODS AND TECHNIQUES. Three credit hours. One and a half hours of lecture and one and a half hours of discussion per week. Prerequisites: SOCI 3262 or authorization of the Director of the Department.

Introduction to the fundamental concepts and debates, as well as the basic techniques of qualitative research in the Social Sciences. Critical analysis of the epistemological debates associated with the search for scientific knowledge by means of various qualitative research methodologies, including structured observation of behavior, ethnography, oral history, discourse analysis, as well as ethical considerations. The relation between social research and qualitative research design will be explored, with emphasis on the formulation of appropriate research questions, the documentation of social phenomena and the discussion, interpretation and analysis of data.

SOCI 4231. RESEARCH IN SOCIOLOGY I. Three credit hours. Three hours of lecture per week. Prerequisites: SOCI 3265 and SOCI 4206 and 15 additional credits in Sociology.

Discussion regarding the research process, with emphasis on the development of a research proposal.

SOCI 4232. RESEARCH IN SOCIOLOGY II. Three credit hours. Three hours of conference per week. Prerequisite: SOCI 4231.

Development and presentation of a research project in the field of sociology.

SOCI/PSIC/CIPO 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: 12 credit hours in psychology or sociology or political science, respectively, and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

SOCI/PSIC/CIPO 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSIC 4991 or SOCI 4991 or CIPO 4991, respectively, and authorization of the Director of the Department.

Research project under the supervision of a faculty member.

Advanced Undergraduate Course

SOCI 5008. SOCIOLOGY OF DISASTERS. Three credit hours. Three hours of lecture per week. Prerequisites: SOCI 3007 or ANTR 4007 or SOCI 3010 or SOCI 4027 or GEOG 3185 or authorization of the Director of the Department.

Study of disasters from a social perspective. Analysis of historical, political, institutional, economic, social and human factors that influence social vulnerability and the outcome of disasters. Discussion and application of concepts, theoretical frameworks and research tools in the study of disasters.

SOCI 5015. ENERGY, ENVIRONMENT AND SOCIETY. Three credit hours. Three hours of lecture per week.

Sociological analysis of energy production, distribution and consumption, with emphasis on the global dependency on non-renewable sources and its social and environmental consequences. Discussion of the interrelationship between the public energy policy and contemporary issues at the local and global levels such as climate change, environmental pollution, depletion of natural resources, environmental justice, international tensions and conflicts, and public health.

COLLEGE OF BUSINESS ADMINISTRATION

ADMINISTRATION

ADMI 3009. INTRODUCTION TO BUSINESS, MANAGEMENT, AND ETHICS. Four credit hours. Four hours of lecture per week.

Study of the nature of business and its social, legal, ethical, economic, and political interactions within society. Discussion of traditional and emergent management principles, functions, and theories in a global context. Study of the major functional areas of business.

ADMI 3010. COMPUTER COMPETENCE FOR MANAGERIAL DECISION MAKING. Two credit hours. One hour of lecture and two hours of laboratory per week.

Introduction to the basic understanding of what a computer is, what it can do, and how it can serve managers in their professional endeavors. Use of software packages for various applications such as word processing, electronic spreadsheets, and presentation tools in a computer laboratory.

ADMI 3015. INTRODUCTION TO INTERNATIONAL BUSINESS. Three credit hours. Three hours of lecture per week.

Problems and possibilities of doing business in an international context. Provides perspectives required for successful management and planning of international enterprises. Identification of opportunities and difficulties inherent in international business. Major features of the world economy, of the multinational corporation (mnc), of current international economic issues, and how international business deals with these problems.

ADMI 3017. INTRODUCTION TO ENTERPRISE DEVELOPMENT. Two credit hours. Two hours of lecture per week.

Introduction to the overall process of developing enterprises, from the recognition of an opportunity to the implementation of the business. Emphasis on the particular needs of the enterprise as it moves through the various stages of the business life cycle.

ADMI 3018. ADVANCED SPREADSHEET TECHNIQUES. Two credit hours. One hour of lecture and two hours of laboratory per week. Prerequisites: ADMI 3010.

Study focused on the use of advanced spreadsheet functions for solving complex problems, including data integration, data analysis, and development of macros.

ADMI 3028. ADVANCED SPREADSHEET TECHNIQUES. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: ADMI 3010 or COMP 3057 or ECAG 3007 or INGE 3016 or ADOF 4020.

Study focused on the use of advanced spreadsheet commands and functions for solving simple and complex problems, including importing data from other platforms and formats, data filtering, data validation, advanced logic functions, advanced charts, data manipulation, creating and using range names, data lookup, pivot tables, data integration, data analysis, data security and recording basic macros.

ADMI 3100. NEW BUSINESS DEVELOPMENT. Three credit hours. Three hours of lecture per week.

Introduction to the theory and practice of establishing a small business. Topics include, among others: how to start and develop a new business, acquiring a franchise or buying an existing one.

ADMI 3125. TECHNOLOGY BASED ENTREPRENEURSHIP. Three credit hours. Three hours of lecture per week.

Process of starting a business based on technology, emphasizing the management of existing enterprises. It includes topics such as: market analysis, proposal preparation product design specification (PDS), prototype design, product cost, strategic management, manufacturing facilities design, and business plan.

ADMI 3150. BUSINESS PLAN DEVELOPMENT. Three credit hours. Three hours of lecture per week.

Development of a business plan for a small or medium-sized enterprise. Components of a business plan, its importance, and its use as an administrative tool.

ADMI 3155. CREATIVITY AND ENTREPRENEURIAL INNOVATION. Three credit hours. Three hours of lecture per week.

Study of the creativity process and ways to use it as tools for entrepreneurial innovation. Evaluates creative and innovative ideas of products and services in terms of the risks and opportunities involved. Creation and innovation of products and services that could be developed into a business.

ADMI 3315. FUNDAMENTALS OF E-COMMERCE. Three credit hours. One hour of lecture and two hours of laboratory per week. Prerequisites: MERC 3115 and ADMI 3010.

Study of the technological and strategic aspects of internet-based electronic commerce. Discussion of topics such as planning, marketing strategies, security, and international, legal, and ethical issues.

ADMI 4001. INTRODUCTION TO LAW. Three credit hours. Three hours of lecture per week.

An introduction to the nature and source of the Law, its fundamental principles, and the Judicial System. Emphasis will be given to basic principles of Constitutional, Administrative and Penal Law as well as the Law of Torts and Contracts and their relationship with business organizations. The course will provide the basis for future study of commercial contracts and relationships.

ADMI 4002. BUSINESS LAW. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4001.

The study of the law applicable to business contracts and the formation, organization, and administration of entities.

ADMI 4016. ENVIRONMENT ORGANIZATIONS. Three credit hours. Three hours of lecture per week.

Study of the legal and socio-political environment within which the business system operates in order to be able to analyze and understand the basic problems and issues the organization is facing in today's world.

ADMI 4018. STRATEGIC MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ((CONT 4045 or CONT 4019 or CONT 3008) or FINA 4037 or (GERE 4009 and GERE 4008) or GERH 4019 or (MERC 4230 and (MERC 4218 or MERC 4236)) or SICI 4089).

Integrative capstone course in which management skills are applied to analyze and formulate effective strategies for multifunctional business situations confronted by top management. Includes the use of case studies and business simulations to experience the impact of implementing diverse business strategies.

ADMI 4026. INTERNATIONAL ORGANIZATIONS AND ENTREPRENEURSHIP. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3009.

Description of the challenges and opportunities of entrepreneurship from an international perspective. Analysis of local entrepreneurial challenges in light of entrepreneurial indexes and reports published by international organizations such as the Organization for Economic Co-operation and Development (OECD), the World Economic Forum (WEF), the World Trade Organization (WTO), the International Monetary Fund (IMF), the United Nations (UN), the Global Entrepreneurship Monitor (GEM), and the World Bank, using an outside-in approach.

ADMI 4039. BUSINESS RESEARCH METHODS. Three credit hours. Three hours of lecture per week. Prerequisites: (ESTA 3002 and MATE 3049) or authorization of the Director of the Departament.

Study of fundamentals of research design and their applications in business. Introduction to survey design and its statistical analysis. Application of research skills in an individual or team project. Exposure to the concepts of ethics and social responsibility in research and reporting.

ADMI 4040. BUSINESS DOCUMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

The study and use of language in oral and written communication. Application of the principles of logic and psychology in the editing of commercial and official documents commonly used in business. Use of principles of editing in letters of reference, claims, and collections. Analysis of publicity as a mass communication media and its effective use in the business world.

ADMI 4056. SEMINAR. Two credit hours. One hour of lecture and two hours of supervised practice per week. Prerequisites: ADMI 4039 and (GERE 4045 and GERE 4009) or (MERC 4230 and (MERC 4218 or MERC 4236)) or (GERH 4007 or ESOR 4007) or (GERH 4019 or ESOR 4019).

Capstone course that integrates philosophies, practices, and research of current business problems. Students are required to work in groups to submit and present a research report in their field of study.

ADMI 4057. SEMINAR. Three credit hours. Three hours of lecture per week. Prerequisites: ESTA 3002 and ((MERC 4215) or (GERE 4008 and GERE 4009) or (GERH 4009 and GERH 4016) or (FINA 4036 and FINA 4037) or (CONT 4016 or CONT 4017)).

An advanced and integrated course for business students. Philosophies, practices, and investigation of current problems in the field. Every student is required to submit an original dissertation on a subject or a current problem for the business manager, in a partial fulfillment of the course requirements.

ADMI 4058. COMPARISON OF ADMINISTRATIVE SYSTEMS AMONG ENTERPRISES IN PUERTO RICO AND OTHER COUNTRIES. Three credit hours. Fifteen hours of conference and a minimum of eighteen hours of visits to enterprises in Puerto Rico and a trip of at least twelve days to the selected countries. Prerequisite: authorization of the Dean of Business Administration.

Comparative analysis of administrative and industrial practices among different enterprises in Puerto Rico and the other countries. Managerial functions, processes, and organizational structures of enterprises will be highlighted. Includes conferences; and plant tours of enterprises.

ADMI 4085. FUNDAMENTALS OF PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week.

Analysis of the project as a means to achieve an organization's strategic plan, as well as the role of the project manager. Study of the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing. Includes the management of the competing requirements of scope, time and cost.

ADMI 4116. THE HUMAN DIMENSION OF PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4085.

Study of principles and theoretical concepts to provide a general frame to understand, analyze and manage the human aspects in the project management context. Discussion of the development of effective work teams, negotiation and conflicts management, and crisis management among others.

ADMI 4335. STRATEGIES FOR CHANGE AND GROWTH OF SMALL AND MIDSIZE BUSINESSES. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3100.

Study of the alternatives of growth, downsizing, and diversification for effective business decision-making in a changing, competitive environment.

ADMI 4995. SPECIAL PROBLEMS. One to six credit hours. Prerequisite: authorization of the Director of the Department.

Individual studies, investigations, or special problems in any of the various aspects of Business Administration. Problems or topics will be assigned according to the interests and need of individual students. Work will be carried out under the supervision of a faculty member.

ADMI 4996. SMALL BUSINESS ADVISING. One to three credit hours. Two to six hours of consultation and advising per week to participating enterprises. Prerequisite: authorization of the Dean of the Faculty.

Students will be assigned to small business administration cases, Junior Achievement mini-companies, and other appropriate organizations to develop perspective and analytical insight about operations, decision-making processes, and interpersonal, group and intergroup relations. Supervision will be in charge of a Faculty member.

ADMI 4997. BUSINESS PRACTICE FOR COOP STUDENTS**.** Three to six credit hours. A maximum of three work periods will be permitted. Prerequisite: authorization of the Dean of the Faculty.
Supervised work experience in a government agency, private enterprise or foundation, in accordance with the student's academic background and the requirements of the work.

ACCOUNTING

CONT 3005. ELEMENTARY ACCOUNTING I. Four credit hours. Four hours of lecture per week.

The study of the basic procedures and principles of accounting related to recording business transactions and preparing and using financial statements of an enterprise. The following topics will be discussed: the accounting cycle, financial statements, accounting and valuation of assets and current liabilities.

CONT 3006. ELEMENTARY ACCOUNTING II. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 3005.

Continuation of the study of the basic procedures and principles of accounting relative to the recording of business transactions, preparation and use of the financial statements of an enterprise. The following topics are discussed: accounting and valuation of assets, liabilities accounting, organization forms, and elements of cost accounting.

CONT 3007. INTERMEDIATE ACCOUNTING I. Four credit hours. Four hours of lecture per week. Prerequisites: CONT 3006 or CONT 3012.

Study of the principles and procedures of financial accounting at the intermediate level applied to problems of recording and valuation of assets, liabilities, corporate capital, and income determination. Includes the presentation and correction of financial statements.

CONT 3008. INTERMEDIATE ACCOUNTING II. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 3007.

Continuation of the study of the principles and procedures of financial accounting at the intermediate level applied to problems of recording and valuation of assets, liabilities, corporate capital, and income determination. Includes the presentation and correction of financial statements.

CONT 3011. FINANCIAL ACCOUNTING PRINCIPLES I. Three credit hours. Three hours of lecture per week.

Study of the basic principles of accounting, procedures related to the accounting cycle, and the preparation and use of financial statements of service and merchandising enterprises. Includes topics such as: analysis, recording and posting of transactions, financial statements, accounting and valuation problems of cash, accounts receivable, and inventories. Use of software related to the accounting cycle.

CONT 3012. FINANCIAL ACCOUNTING PRINCIPLES II. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 3011 or CONT 3005.

Study of the basic principles and procedures of accounting related to the recording of business transactions and the preparation and use of financial statements. Includes topics such as: accounting for plant assests, liabilities, capital structure of business organizations, investments, and the statement of cash flow. Use of software related to the accounting cycle.

CONT 4006. MANAGERIAL ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 3006.

This course is required for non-accounting major students. The aspects and techniques of accounting that are useful to managers in the performance of their basic functions of planning, organizing, directing and controlling are analyzed and interpreted. The course also includes three basic areas: analysis and interpretation of financial statements, costing procedures in manufacturing enterprises and accounting, and planning techniques useful to the decision-making process.

CONT 4007. FEDERAL INCOME TAX. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3016 or CONT 4018.

Study of the necessary principles and procedures to prepare an income tax return for individuals, partnerships and corporations according to the United States of America income tax law. Special attention is given to the computation of gross income and deductions to determine taxable net income.

CONT 4009. INCOME TAX OF PUERTO RICO. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3016 or CONT 4006 or CONT 4018 or CONT 3007 or CONT 4035 or CONT 4078.

Study of principles and procedures necessary to prepare an income tax return according to the Income Tax Law of the Commonwealth of Puerto Rico, for individuals, partnerships and corporations. Special attention is given to the computation of gross income and deductions according to the law to determine taxable net income.

CONT 4015. ADVANCED ACCOUNTING PROBLEMS I. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 4019.

Study and discussion of special problems in the field of accounting. Includes the study of partnership, home office and branch relationships, business combinations, and consolidated financial statements, among other topics.

CONT 4016. RECENT DEVELOPMENTS IN ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 4019 or CONT 4045.

Study and analysis of the fundamentals and developments of accounting theory. Recent developments in the private as well as the public sector will be discussed. The historical development and content of selected fundamentals and current issues in the field will be emphasized.

CONT 4017. AUDITING AND SYSTEM. Three credit hours. Three hours of lecture per week. Prerequisites: CONT3008 or CONT4019.

Study of the principles of auditing and their application in the audit of financial statements and contemporary developments in the field. Detailed discussion of the steps required to perform an audit engagement with emphasis in risk assessment, internal control structure, audit procedures, and the different audit reports used to communicate the findings. Discussion of the Code of Professional Ethics.

CONT 4018. INTERMEDIATE ACCOUNTING I. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: CONT 3006.

Study of the principles and procedures of financial accounting at the intermediate level applied to problems of recording and valuation of assets, liabilities and corporate capital, income determination, and expenditures. Includes the presentation, analysis, interpretation, and correction of financial statements.

CONT 4019. INTERMEDIATE ACCOUNTING II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: CONT 4018.

Study of the principles and procedures of financial accounting at the intermediate level applied to problems of recording and valuation of assets, liabilities and corporate capital, income determination, and expenditures. Includes the presentation, analysis, interpretation, and correction of financial statements.

CONT 4027. ANALYSIS AND COST CONTROL. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 4078 or CONT4035.

Study of the quantitative techniques for solving accounting problems in the areas of planning and cost control. The course includes budgets, standard cost, variable cost, distribution cost analysis, gross margin analysis, and other selected topics in advanced costs and managerial accounting.

CONT 4035. COST ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3016.

Study of the methods and procedures of accounting in the determination of the cost of a product. Accounting procedures for the main elements of the cost of a product using job-costing and process-costing systems for cost accumulation. Special emphasis is placed on the discussion for managerial analysis and control of production costs.

CONT 4037. ACCOUNTING INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3010 and (FINA 3016 or CONT 4035 or CONT 4006).

A study of accounting information systems and their role in management planning and decision-making. Data processing considerations in the design and operation of accounting information systems and principles of internal control with emphasis in computerized accounting systems. Apply accounting applications using software packages.

CONT 4045. ADVANCED ACCOUNTING I. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 4019 or CONT 3008.

Study and discussion of special problems in the field of accounting. Includes the study of partnership, home office and branch relationships, business combinations, and consolidated financial statements, among other topics.

CONT 4046. ACCOUNTING FOR GOVERMENTAL ENTITIES AND NOT FOR PROFIT ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 4045 or CONT 4015.

Study of the accounting standards and financial reports of governmental entities and not-for-profit organizations.

CONT 4048. ADVANCED ACCOUNTING II. Four credit hours. Four hours of lecture per week. Prerequisites: CONT3008 or CONT4019.

Study of the accounting aspects related to multinational enterprises. Topics such as restructuring and bankruptcies, personal financial statements, estates and trusts, franchises, financial derivatives, and disclosure requirements of the Securities and Exchange Commission will be discussed among other topics.

CONT 4078. COST ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 3012.

Study of the methods and procedures of accounting in the determination of the cost of a cost object. It includes the accounting procedures for the three main elements of the cost of a product (raw materials, direct labor, and manufacturing overhead) using job-costing and process-costing system for cost accumulation. Special emphasis is placed on the discussion for managerial analysis and control of production costs.

CONT 4117. SERVICE LEARNING THROUGH VOLUNTARY INCOME TAX ASSISTANCE (VITA). Three credit hours. Three hours of lecture, discussion and workshop per week.

Application of individual tax concepts in professional practice through community service through VITA program.

CONT 4995. ACCOUNTING INTERNSHIP. One to six credit hours. Prerequisites: (CONT 3008 or CONT 4019) and authorization of the Director of the Department.

Work experience in the area of accounting in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

CONT 5006. TAX LIABILITIES FOR BUSINESSES IN PUERTO RICO. Three credit hours. Three hours of lecture per week.

A comprehensive study of business tax liabilities in Puerto Rico under local of federal laws. Includes topics such as property, municipal, labor-related and excise taxes as well as tax exemptions under the Industrial Incentives Act.

CONT 5007. ADVANCED ACCOUNTING RESEARCH. Three credit hours. Three hours of lecture, discussion and research per week. Prerequisites: CONT 3008 or CONT 4019 or authorization of the Director of the Department.

Application of various research methodologies in accounting topics. Development of skills to identify, compile, measure, summarize, verify, and interpret financial and non financial data for decision making purposes.

HUMAN RESOURCES MANAGEMENT

ESOR 4005. GOVERNMENTAL CONTROL OF BUSINESS. Three credit hours. Three hours of lecture per week.

Presents a brief explanation of local and federal statutes geared to protect business against coercion and monopoly. Comprehends the powers of state to enforce the law, the civil and criminal remedies, and the protection of the affected parts, the governmental regulation of securities, as well as the regulation of distribution contracts. Also contains a brief explanation of the laws that regulates retails, installment sales, financing of conditioned sales, leases, loans, and consumer services.

ESOR or GERH 4037. MANAGING DIVERSITY IN ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: GERH 4008 or ESOR 4008.

Study of demographic diversity in today's global environment. Techniques for the effective management of a diverse workforce. Study of the sources of diversity-related conflicts in organizations, constructive approaches for dealing with these conflicts, and how organizations can leverage diversity for competitive advantage. A group project is required.

GERH 4007. ORGANIZATIONAL DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: (ESOR 4006 or GERH 4006) or (ESOR 4025 or GERH 4025).

Comparative study of major approaches for the effective design of organizational structures in alignment with business strategy. Application of design principles to a simulated business situation will allow students to assess the impact of power and influence, organizational culture, and conflicts.

GERH 4008. HUMAN RESOURCES DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3009 or ESOR 4006 or GERH 4006 or ININ 4029.

Study of the basic processes of human resources management. The strategic nature of staffing, training, compensation, and labor relations will be discussed within a global and ethical context.

GERH 4010. WOMEN AND WORK. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4008 or GERH 4008 or ININ 4035 or SOCI 3262 or PSIC 3006.

Study of the characteristics of the working woman. Nature of paid and unpaid work and its relationship with the notion of woman, changes in the female labor force participation, occupational segregation, wage differences by gender, women career development in traditional and nontraditional occupations. All topics will be analyzed in the context of government and business policies.

GERH 4015. WORKFORCE PLANNING AND EMPLOYMENT. Three credit hours. Three hours of conference per week. Prerequisites: ESOR 4008 or GERH 4008.

Practical study and applications of all aspects of the staffing process, from recruitment to termination and outplacement. Study of human resources planning, human resources information systems, employee rights, and affirmative action plans. Discussion of the strategic nature of performance management and employee development.

GERH 4016. LABOR RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4008 or GERH 4008.

Analysis of the legal framework of labor relations and operation of labor unions with emphasis in the United States and Puerto Rico. Collective bargaining in the private and public sectors, and the process of conflict negotiation and resolution will be discussed. A group project is required.

GERH 4017. COMPARATIVE LABOR LAW. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4015 or GERH 4015.

Comparative study of existing and proposed labor laws in Puerto Rico, the United States, and other jurisdictions. Emphasis on the study of alternative work periods, compensation and benefits, and other working conditions.

GERH 4019. COMPENSATION MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: (ESOR 4015 o GERH 4015 o ESOR 4008 o GERH 4008) y ESTA 3001.

Analysis and evaluation of the different factors and norms considered to design a compensation system. Basic tools such as job analysis, job evaluation, and salary surveys are applied to a case study within the framework of compensation legislation, salary regulations, and labor relations.

GERH 4025. ORGANIZATIONAL BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3009 o ESOR 4006 o GERH 4006.

Study of the development of the behavioral forces that shape the decision-making and leadership of organizations. Perception, motivation, communication, conflict, process change, and other variables which impact human behavior at the individual, group and organizational levels will be discussed. Concepts are applied through cases and experiential learning.

GERH 4027. LEADERSHIP IN ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4025 or GERH 4025.

Analysis of literature on leadership in organizations to identify effective management styles from a contingency perspective. Roles of leaders in organizations. Current trends in leadership.

GERH 4030. HUMAN RESOURCES DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4008 o GERH 4008.

Study of general psychological principles such as the learning process, learning styles, motivation, communication, and perception, and how these apply to the training of technical and managerial employees. Application of the development of training programs including needs assessment and evaluation of training efforts. A group project is required.

GERH 4035. INNOVATION AND ORGANIZATIONAL CHANGE. Three credit hours. Three hours of lecture per week. Prerequisites: GERH 4007 or ESOR 4007.

Study of the different approaches for introducing process, structural, technological, and behavioral changes in organizations. Discussion of models for intervention and the role of managers as agents of change. A field project is required.

GERH 4036. INTERPERSONAL COMMUNICATION IN THE WORKPLACE. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3009 or (ADMI 4016 and ESOR 4006).

Study of the conceptual and practical nature of interpersonal communication and how it is affected by issues such as ethical challenges, workforce diversity, and technology. Discussion of the skills and attitudes necessary to communicate effectively within the work environment.

GERH 4995. HUMAN RESOURCES MANAGEMENT INTERNSHIP. One to six credit hours. (GERH 4015 and (ESOR 4007 or GERH 4007) and authorization of the Director of the Department) or ((ESOR 4007 or GERH 4007) and (ESOR 4009 or GERH 4009) and authorization of the Director of the Department).

Work experience in the area of human resources in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

STATISTICS

ESTA 3001. BUSINESS STATISTICS I. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: MATE 3049 or MATE 3000 or MATE 3172 or MATE 3174.

Introduction to concepts of business statistics. Includes descriptive statistics, for summarizing and presenting the essential information graphically and numerically, basic probability concepts, probability distributions and sampling distributions. Includes laboratory practice and application of statistics and data analysis in a project.

ESTA 3002. BUSINESS STATISTICS II. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: ESTA 3001.

Statistical inference as applied to business situations. Includes univariate and bivariate analysis, multiple regression analysis, basic concepts of experimental design, and non-parametric methods. Includes laboratory practice and application of statistics and data analysis in a project using computers.

FINANCE

FINA 3005. PRINCIPLES OF INSURANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ESTA 3001.

Basic concepts and problems found in all types of modern-day insurance and in other methods of handling risk. Considers the most important elements of risk and insurance from the managers point of view, the economic viewpoint of society as a whole and the individual consumers viewpoint.

FINA 3006. BUSINESS FINANCE. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 3006 and ADMI 3010.

Financial analysis, including sources and uses of fund statement, cost and control of business funds, working capital management, long-term financing, capital budgeting, financial structure and the use of leverage.

FINA 3016. BUSINESS ANALYSIS USING FINANCIAL REPORTS. Four credit hours. Four hours of lecture per week. Prerequisites: (CONT 3012 or CONT 3006) and (ADMI 3009 or (ESOR 4006 and ADMI 4016)).

Analysis of an organizations financial performance based on its published financial reports. Use of financial data in making management decisions.

FINA 3017. MONEY, BANKING, AND ECONOMIC CONDITIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3022.

Analysis of the U.S. financial system, its response to and impact on economic activity and policy. Role of the financial markets on intermediation. Emphasis on interest rates, monetary policy, securities and their markets, the Federal Reserve System, business cycles, and risk management by financial institutions.

FINA 3018. WORKING CAPITAL MANAGEMENT. Two credit hours. Two hours of lecture per week. Prerequisites: FINA 3016 or FINA 3006.

Study of the financing and management of the acquisition, maintenance and disposition of working capital. Emphasis on determining the optimum levels of current assets and current liabilities to minimize risk and maximize return.

FINA 3035. PERSONAL FINANCIAL MANAGEMENT. Three credit hours. Three hours of lecture per week.

Study of concepts of personal financial planning. Topics include the financial planning process, money management and investments, insurance needs, income tax planning, retirement planning and estate planning.

FINA 3037. FINANCIAL ANALYSIS AND FINANCING OF SMALL AND MEDIUM ENTERPRISES. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3100 o CONT 3006 o CONT 3012.

Identification of how entrepreneurs obtain and use financial resources and how they analyze their financial information to effectively manage their business. Analysis of the financing process and the available alternatives, and how financial contracts are structured to manage risk and obtain incentives.

FINA 4017. INTRODUCTION TO FINTECH. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3017.

Introduction to services available related to Financial Technology. Analysis of the critical context and framework of traditional money, banking and financial markets. Study of the relationship between Fintech and entrepreneurship. Overview of Fintech regulations, payments, processes, and innovation around the world.

FINA 4028. INTERNATIONAL FINANCE. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3017 or FINA 3006.

Application of finance principles in the international environment, including the balance of payment mechanism, the factors affecting the foreign exchange market and defensive techniques to protect the business against foreign exchange risk.

FINA 4029. FINANCIAL MARKETS. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisites: ECON 3021 and ECON 3022.

A comprehensive survey of the macro financial system, including both domestic and international aspects. It introduces the student to modern capital and money markets theory. It analyzes the operations of commercial banks and other financial institutions as holders of savings and sources of money and credit. It also examines the supply, demand and flow of investible funds, the structure of interest rates and the impact of monetary and other governmental policies on interest rates and flow of funds.

FINA 4035. FINANCIAL MARKETS. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisites: FINA 4029.

A comprehensive survey of the macro financial system, including both domestic and international aspects. It introduces the student to modern capital and money markets theory. It analyzes the operations of commercial banks and other financial institutions as holders of savings and sources of money and credit. It also examines the supply, demand and flow of investible funds, the structure of interest rates and the impact of monetary and other governmental policies on interest rates and flow of funds.

FINA 4036. ADMINISTRATION OF FINANCIAL INSTITUTIONS. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3017 or FINA 4035.

Study of the role of the major financial institutions and the principal financial management problems the institutions face. Emphasis is given to management problems of commercial banks, savings and loan associations, life insurance companies, credit cooperatives and how pension plans function.

FINA 4037. FINANCIAL INVESTMENT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3016 or FINA 3006.

Study of the principles of the investment process and investment alternatives, including security analysis, information on securities markets, risk-return analysis, and security pricing models.

FINA 4039. PUBLIC SECTOR FINANCES. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The study of the allocation, distribution, and stabilization functions of the modern state and their effects on the business firm; analysis of public sector budget policies from the point of view of income and expenditure, theories of taxation; public expenditure, budget incidence and effects, public debt; and their effect on the business decision-making process.

FINA 4040. CURRENT FINANCIAL TRENDS. Three credit hours. Three lectures per week. Prerequisites: FINA 4035, FINA 4037 and FINA 4046.

Current developments in the field of money, banking, foreign exchange, corporation finance, investment, and allied fields. Special attention is given to the developments in Puerto Rico, and to those developments abroad which affect Puerto Rico.

FINA 4046. CORPORATE FINANCE. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3016 or FINA 3006.

Analysis of the implications of modern financial theory for the major decisions corporate managers face. Emphasis will be given to decision making in the areas of capital budgeting, capital structure, long and short term financing decisions, and working capital management.

FINA 4047. INVESTMENT ANALYSIS AND PORTFOLIO SELECTION. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 4037.

In-depth study of the field investment including portfolio theory and management. The course includes investment policies, risk handling, timing of investment decisions and portfolio performance. A portfolio construction and management project is required.

FINA 4048. CREDIT AND COLLECTION MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 3016 or FINA 3006.

Study of advanced theory and practices of credit collection management. Evaluation of commercial and personal loan applications based on available credit options, laws and regulations.

FINA 4055. FINANCIAL DERIVATIVES. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 4037.

Study of financial derivatives, such as options, forwards, futures, and swaps. Trading, pricing, and their arbitrage relationships will be discussed.

FINA 4069. INTEGRATIVE FINANCE. Two credit hours. Two hours of lecture per week. Prerequisites: FINA 4037 and FINA 4046 and ADMI 4039.

Capstone course that integrates financial decision-making in functional areas of business; utilizes various concepts to promulgate strategies, policies, and procedures in managing finance to achieve the company's goals. Case analysis and a research project are required.

FINA 4995. FINANCE INTERNSHIP. One to six credit hours. Prerequisites: FINA 4046 and authorization of the Director of the Department.

Work experience in the area of finance in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

FINA 5015. PRINCIPLES OF FINANCIAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (ESTA 3002 and MATE 3049) or authorization of the Director of the Department.

Introduction to the development of financial strategies and financial instruments according to the efficient market hypothesis.

OPERATIONS MANAGEMENT

GERE 4008. QUANTITATIVE METHODS IN OPERATIONS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: GERE 4007 or GERE 4022 or GERE 4046.

Application of mathematical models and techniques in operations research to the analysis, formulation and solution of operations problems such as allocation of resources, inventory control and scheduling. Probabilistic as well as deterministic models are considered emphasizing linear programming. Attention is centered on the formulation of problems and the evaluation of methodology.

GERE 4009. PRODUCTION PLANNING AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisites: GERE 4046 or GERE 4007 or GERE 4022.

Study of the production planning and control system with emphasis on Master Production Scheduling, Material Requirements Planning, Capacity Planning and Utilization and Production Activity Control.

GERE 4021. PRODUCTION MANAGEMENT I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3011 or MATE 3049) and (ESOR 4006 or GERH 4006) and ESTA 3002 and ADMI 3010.

Concepts, techniques and decision-making procedures encountered in the management of production operations. Basic processes within an industrial organization with emphasis on inventory procurement and control, and problems typical of manufacturing operations.

GERE 4022. PRODUCTION MANAGEMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4021.

Development and operation of production control systems with special emphasis on problems of production planning, scheduling, and inventory control under conditions of uncertainty. Also includes simulation techniques.

GERE 4028. MATERIALS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022.

Economic, legal and environmental problems encountered in the acquisition and management of inventories; application of modern business methods to their solution.

GERE 4030. CONTEMPORARY ASPECTS OF INDUSTRIAL MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4022.

Integration of practical and theoretical aspects of areas related to Industrial Management: Just in Time, Material Requirement Planning I and II, Quality Assurance, and others.

GERE 4036. ASSURANCE SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisites: ESTA 3002 and (GERE 4046 or GERE 4022).

Study of techniques for monitoring and improving the quality, maintainability, reliability, and safety of products and processes. Discussion of issues of health, ethics, and social responsibility. A team research project in an organization is required.

GERE 4045. SUPPLY CHAIN MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: GERE 4046 or GERE 4007 or GERE 4022.

Study of the movement of products, services, and information among all links in the value chain. Emphasis on supplier selection and relationships, material management including purchasing, inventories, distribution, and transportation.

GERE 4046. OPERATIONS MANAGEMENT. Four credit hours. Four hours of lecture per week. Prerequisites: ESTA 3001 and (ADMI 3009 or (ADMI 4016 and ESOR 4006)).

Study of qualitative and quantitative techniques, decision-making procedures, processes, and tools used in the operations of manufacturing and service organizations.

GERE 4055. SERVICE OPERATIONS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: GERE 4007 or GERE 4046 or GERE 4022.

Study of mainstream and emerging service industries with emphasis on their operational strategies for obtaining competitive advantage. Includes topics such as: revenue management, service quality management, and the impact of information technology on the productivity of services.

GERE 4085. PROJECT MANAGEMENT APPLICATIONS IN BUSINESS. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4085.

Applications of project management tools to the management of project related businesses.

GERE 4318. QUALITY CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4046.

Study of principles, techniques and international standards for statistical quality control in production. Includes double sampling and sequential plans.

GERE 4335. PURCHASING MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4046.

Analysis of the purchasing function and its relation to production, marketing, finance and engineering. Emphasis on the policies and the organization of a purchasing system considering the necessary legal aspects and strategies to create an efficient system.

GERE 4336. INVENTORY MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4046.

Principles and mathematical models for the adoption of decisions in the manufacture inventory (MRP), finished products and the concept of distribution resources planning (DRP).

GERE 4995. OPERATIONS MANAGEMENT INTERNSHIP. One to six credit hours. Prerequisites: (GERE 4008 or GERE 4022) and authorization of the Director of the Department.

Work experience in the area of operations management in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

MARKETING

MERC 3115. PRINCIPLES OF MARKETING. Three credit hours. Three hours of lecture per week.

Introduction to the concepts, principles, activities, techniques and strategies of the function of marketing in a national and international context. Applications to different types of organizations will be discussed.

MERC 3117. SELLING AND SALES MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115.

Study of traditional and emerging selling techniques making effective sales presentations. Current theories about selling of goods and services including building trust in customers, sales ethics, behavior of customers in purchasing, and effective communication in selling will be covered. The organization and management of the sales force will be discussed.

MERC 3120. INTRODUCTION TO DIGITAL MARKETING. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisite: MERC 3115.

Introduction to the challenges, changes, and tendencies in the marketing environment from a technological perspective. Study of the relationship between marketing and enterprises.

MERC 4009. PROMOTION AND ADVERTISEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 4217.

Introduction to the basic concepts of promotion management. Stimulation of demand through personal selling and advertising. Managerial issues and problems of the promotional manager.

MERC 4065. GLOBAL MARKETING STRATEGIES. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 y ECON 3022.

Analysis of international marketing strategies considering market trends, costs, forecasting, pricing, sourcing, and distribution factors. Development of an international export/import marketing plan including strategy analysis and formulations and evaluation of portfolios of product offerings at domestic or global levels.

MERC 4075. MARKETING RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 and ESTA 3002.

Systematic gathering, recording and analysis of data about problems relating to the marketing of goods and services.

MERC 4215. RETAIL MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 3115.

Study of the philosophy, concepts, strategies and techniques in the retail selling business. Emphasis will be placed in topics of strategic planning, inventory management, location analysis, merchandising, human resources, pricing and promotion.

MERC 4217. CONSUMER BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 3115.

The study of individuals, groups, and organizations in their role as consumers of goods and services, including selection processes consumers use and their impact on organizations of the public and private sector, as well as not-for-profit organizations. Discussion includes how marketing strategies are developed to influence the way consumers behave.

MERC 4218. MANAGEMENT OF LOGISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 and (GERE 4007 or GERE 4022 or GERE 4046).

Analysis of the activities pertinent to the distribution channel as well as their integration to the overall marketing activities of the business. Special emphasis will be given to the management of physical distribution activities including packaging, management of transportation, electronic channels and customer services.

MERC 4230. INTEGRATED MARKETING COMMUNICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 4217.

Study of the basic concepts of integrated marketing communications management. Discussion of traditional and emerging marketing communications functions and their use in developing effective communication strategies and programs from a global and ethical perspective.

MERC 4236. SERVICES MARKETING. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 3115.

Study of the nature of service organizations. Development of strategies, elements, and marketing mix in the service market with emphasis on the differences between the marketing of traditional goods and services.

MERC 4995. MARKETING INTERNSHIP. One to six credit hours. Prerequisites: MERC 4217 and authorization of the Director of the Department.

Work experience in the area of marketing in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

COMPUTERIZED INFORMATION SYSTEMS

SICI 3018. FUNDAMENTALS OF INFORMATION SYSTEMS. Two credit hours. Two hours of lecture per week. Prerequisites: ADMI 3010.

Discussion of concepts related to information technology, information systems development and application software. Study of the use and impact of information technology in businesses and how it improves information quality, timeliness and competitive advantage.

SICI 3029. PROGRAMMING FUNDAMENTALS FOR BUSINESS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ADMI 3010.

Study of the fundamentals of object-oriented programming for the development and implementation of programs that support the managerial decision-making process. Practical laboratory experience in object-oriented programming.

SICI 3051. PROGRAM DEVELOPMENT I. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3010.

Elemental computer programming and solution of managerial problems using a modern programming language. Fundamentals of structured program design: development, testing, implementation and documentation; language syntax, file structure, and operational system facilities for the implementation of programs that generate managerial reports.

SICI 3052. PROGRAM DEVELOPMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

Advanced computer programming and managerial problem solving using a modern programming language.

SICI 3056. STRUCTURED LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

Algorithm design using the logical structures of sequence, selection, and iteration. Modularized top-down design using functions, procedures, and static and dynamic data structures. Structured languages such as Pascal or Ada will be used.

SICI 3057. DATA STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3029 or ((SICI 3052 and (SICI 3056 or SICI 3058)).

Study of the fundamental nature of digital information and storage structures and their manipulation.

SICI 3058. PROGRAMMING IN C LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3052 or SICI 3029.

The study of the unique characteristics of the c language. Programs for different business applications will be developed using its flexibility to work at a lower level of computer hardware. Introduction to object oriented programming using C++. Control the physical components of computers. Object oriented programming concepts will be used.

SICI 3059. INFORMATION SYSTEMS THEORY AND PRACTICE. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3010.

Description and use of information systems as a support tool in the managerial decision process; utilization of information as a resource to provide competitive advantage. Planning, implementation, and efficient project management using information systems.

SICI 3108. FUNDAMENTALS OF WEB DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3029 or COMP 3057 or COMP 3010 or ECAG 3007 or INGE 3016 or CIIC 3011 or CIIC 3015 or ADOF 3107.

Study of web design and development concepts and techniques. Discussion of concepts and development of technical skills required to design, build and implement interactive websites, including learning to code a web page, optimizing images, tables, tools to control the style and layout of multiple web pages, and the latest web developing toolkits to aid in the design process and site management. Discussion and application of introductory responsive web design and javascript language which will be applied to a final project.

SICI 4046. INFORMATION SYSTEMS ANALYSIS AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3029 and ADMI 4085.

Study of analysis and design strategies appropriate for the development of business information systems. Identification of problems, gathering of information to determine system requirements, evaluation of possible solutions and their feasibility, and generation of a logical design. Application of course concepts in projects.

SICI 4085. INFORMATION SYSTEMS ANALYSIS METHODS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

System development life cycle. Process flow, data structure and flow: file and input/output design; program specifications. Collection and reporting activities.

SICI 4087. STRUCTURED INFORMATION SYSTEM ANALYSIS AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3052 and SICI 4085.

Structured analysis and design strategies for dealing with complex information systems.

SICI 4088. DATA COMMUNICATIONS AND NETWORKING. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4085 or SICI 4145.

The study of networking and data communications fundamentals. Data communication and telecommunication concepts, models, standards, and protocols will be studied. Installation, configuration, systems integration and management of networking and telecommunications technologies will be practiced in the laboratory.

SICI 4089. DATA COMMUNICATIONS AND NETWORKING. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4146.

Study of networking and data communications fundamentals. Analysis of data communication and telecommunication concepts, models, standards, and protocols. Laboratory practice in installation, configuration, systems integration and management of networking and telecommunications technologies.

SICI 4095. DATABASE DEVELOPMENT. Three credit hours. Two hours of lecture and one hour of laboratory per week. Prerequisites: SICI 4046 or SICI 4085.

Fundamentals of database systems, emphasizing data modeling and design, basic notation, query processing, and database services including concurrency, security and integrity. The laboratory will provide hands-on experience with database applications.

SICI 4096. MANAGEMENT OF CONTEMPORARY ISSUES IN MANAGEMENT INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 4046 or SICI 4085.

Study of contemporary issues in the area of information technology. Emphasis will be given to technological alternatives for management of current situations, the legal aspects, and the social implications of information technology.

SICI 4097. SYSTEMS DEVELOPMENT. Two credit hours. One hour of lecture and two hours of workshop per week. Prerequisites: SICI 4095 and SICI 4089.

Capstone course where the student will analyze, design, implement, and test a computer information system using appropriate development methodologies. A group project is required where students will develop an information system applying project management principles.

SICI 4140. OFFICE AUTOMATION. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4087.

Information and decision support systems used as critical elements of the managerial decision process. Data managerial report; electronic filing and retrieving systems; word processing and telecommunications.

SICI 4144. BUSINESS PROGRAMMING LANGUAGES. Three credit hours. Two hours of lecture and one hour of laboratory per week. Prerequisites: SICI 3029 or SICI 3052.

Comparative analysis of modern business programming languages. Advanced concepts and capabilities of programming languages used in the business field.

SICI 4145. SOFTWARE AND HARDWARE CONCEPTS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3052.

Technical topics related to computer systems emphasizing the relationship between hardware and software design in the development of business application programs.

SICI 4146. HARDWARE AND SOFTWARE TECHNOLOGY IN INFORMATION SYSTEMS. Two credit hours. Two hours of lecture per week. Prerequisite: SICI 3018.

Discussion of technical aspects of information technology including concepts of computer hardware, software, and networking. Analysis of trade-offs in computer hardware and system software for effective use in organizations.

SICI 4155. DECISION MAKING SUPPORT SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3010 and ESTA 3002.

Specialized information systems used by business managers to support decision-making.

SICI 4157. ADVANCED DATABASE CONCEPTS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4095.

Application of advanced database concepts in the development of management information systems. Discussion of emerging technologies related to database systems. A project is required in which the student will develop a database system.

SICI 4168. INFORMATION SYSTEMS AUDITING. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 4046 and CONT 3011.

Study of techniques, controls and audit types of information systems.

SICI 4175. INTRODUCTION TO JAVA PROGRAMMING. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3029 or SICI 3051 or COMP 3010 or INGE 3016.

Introduction to object oriented programming using Java. Discussion of classes, objects, inheritance, polymorphism, encapsulation, and other fundamental object oriented programming concepts.

SICI 4185. INTRODUCTION TO PROGRAMMING FOR MOBILE DEVICES. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3029.

Introduction to the basic foundations in building mobile device applications. Analysis of the key concepts and basic technical skills for creating fully-functional mobile applications, presuming previous basic programming experience in an object-oriented language (such as Java or C#).

SICI 4186. COMPUTER AND MOBILE FORENSICS INVESTIGATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3010 or ECAG 3007 or COMP 3057 or INGE 3016.

Exploration and analysis of electronic discoveries and issues related to cyber evidence. Use of evidence to identify and analyze the nature of security incidents, the source of potential threats and the methods used in incident management and mitigation. Evaluation of technical and business issues which affect the actions of the enterprise in responding to a security incident.

SICI/COMP 4308. NETWORKING AND ROUTING FUNDAMENTALS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3063 or SICI 4088 or SICI 4089 or COMP 3075.

Study of the terminology of computer networks and their protocols, internet protocol (IP) addressing, introduction to network design, and networking standards. Presentation, study, and configuration of several routing protocols.

SICI 4995. COMPUTERIZED INFORMATION SYSTEMS INTERNSHIP. One to six credit hours. Prerequisites: (SICI 4046 or SICI 4087) and authorization of the Director of the Department.

Work experience in the area of information systems in an organization under the supervision of a faculty member, an Internship Coordinator, and the immediate supervisor at the workplace.

INEL/ICOM/SICI/COMP 5318. INTERMEDIATE ROUTING, SWITCHING AND WIDE AREA NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL/ICOM/SICI/COMP 4308 or authorization of the Director of the Department.

Study and configuration of link state protocols. Study of intermediate level concepts such as switching, wide area network or WAN standards, virtual local area networks or VLAN, network design, and redundancy. Presentation and study of strategies for managing and saving address space such as variable length subnet masks and network address translation.

BACHELOR IN OFFICE ADMINISTRATION

ADOF 3005. ABBREVIATED WRITING SYSTEM IN SPANISH. Four credit hours. Four hours of lecture per week. Prerequisite: ESPA 3102.

Principles of the abbreviated writing system in Spanish. Use of a fast and legible abbreviated reading and writing system at a reasonable speed rate. Review of essential rules for the abbreviated writing system: grammar, punctuation, spelling, and word division.

ADOF 3007. ABBREVIATED WRITING SYSTEM IN ENGLISH. Four credit hours. Four hours of lecture per week. Prerequisites: INGL 3102 or INGL 3104.

Principles of the abbreviated writing system in english. Development of a fast and legible abbreviated reading and writing system. Review of essential rules for the abbreviated writing system: grammar, punctuation, spelling, and word division.

ADOF 3009. RECORDS MANAGEMENT. Three credit hours. Three hours of lecture per week.

Introduction to records management system. Emphasis on the complete process of records management: creation, distribution, use, maintenance, and disposition. Filing operations and retrieval of documents using manual, mechanical, and automated systems.

ADOF 3016. KEYBOARDING AND ITS APPLICATIONS I. Three credit hours. Three hours of lecture per week.

Introduction to the touch method of typewriting. Demonstration of the mastering of basic techniques. Development of the basic skills of speed and accuracy at an acceptable level of performance. Writing of simple office documents.

ADOF 3017. KEYBOARDING AND ITS APPLICATIONS II. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 3016.

Further development of keyboarding skills in the production of office documents at an acceptable level of performance.

ADOF 3036. INFORMATION PROCESSING AND BILLING SERVICES IN MEDICAL OFFICES. Three credit hours. Three hours of lecture per week.

Study of the terminology, format, documents, laws, and ethical aspects related to processing information in medical offices. Application of computer programs in the medical services billing process.

ADOF 3105. INTRODUCTION TO OFFICE ADMINISTRATION. Three credit hours. Three hours of lecture per week.

Application of the basic principles to administrate, plan, organize, direct and control the administrative and operational phase of an office. Basic concepts of supervision: preparation of reports, buying processes and development of systems for office administration.

ADOF 3107. OFFICE CONCEPTS, SYSTEMS AND TECHNOLOGY. Three credit hours. Three hours of lecture per week.

Global vision and general background of the modern office. Study of concepts related to the role of the office as a support system to a company. Analysis of the effects of technology in the equipment, procedures, environment and human factors in the modern office. Study of the key role played by professional specialized in the office systems administration.

ADOF 3115. TELECOMMUNICATIONS IN THE MODERN OFFICE. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3010 or ADOF 3107.

Introduction to the telecommunications in the business environment: telephony, local computer networks, communication channels, hardware, and software. Emphasis in the application of telecommunications to facilitate the exchange of all kind of information: voice, data, text, and images.

ADOF 3125. LEGAL OFFICE ADMINISTRATION. Four credit hours. Four hours of lecture per week. Prerequisite: ADOF 3017.

Study of selected articles of the Civil Code, Notary Law and the Civil Law Procedures of Puerto Rico and their application for the preparation of documents. Study of the legal terminology and the functioning of the General Court of Justice in order to better understand the cases submitted. Preparation of legal documents, such as: deeds, promissory notes, contracts of bargain and sales, law suits, sentences, resolutions, sworn declarations, appeal documents and summon regulations.

ADOF 3135. INTRODUCTION TO BUSINESS TRANSLATION. Three credit hours. Three hours of lecture per week. Prerequisites: (INGL 3102 or INGL 3104 or INGL 3212) and ESPA 3102.

Introduction to business translation with special attention given to idiomatic expressions in English and Spanish used in business.

ADOF 4005. ELECTRONIC PRODUCTION OF DOCUMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 3017.

Application of previously learned typewriting techniques for the production of office documents to an expert level.

ADOF 4015. ELECTRONIC TRANSCRIPTION OF DOCUMENTS IN SPANISH. Four credit hours. Four hours of lecture per week. Prerequisites: ADOF 3005, ADOF 3017. Corequisite: ADOF 4005.

Improvement of the alphabetic writing system and keyboarding skills, and language usage skills: punctuation, spelling, and word division using different equipment. Letters, memorandum and reports of simple to average degree of difficulty will be dictated in Spanish at a reasonable speed simulating an office environment.

ADOF 4017. ELECTRONIC TRANSCRIPTION OF DOCUMENTS IN ENGLISH. Four credit hours. Four hours of lecture per week. Prerequisites: ADOF 3007 and ADOF 3017 and ADOF 4005 and (INGL 3102 or INGL 3104).

Improvement of the alphabetic writing system and keyboarding skills, and language usage skills: punctuation, spelling, and word division using different equipment. Letters, memorandum and reports of simple to average degree of difficulty will be dictated in English at a reasonable speed simulating an office environment.

ADOF 4019. ADMINISTRATIVE OFFICE PROCEDURES. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 3017.

The study of the procedures, techniques, and protocols utilized in the office to accomplish different tasks. Communication and human relation problems.

ADOF 4020. TRAINING IN ELECTRONIC EQUIPMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 3017 and (ADMI 3010 or ADOF 3107).

Theoretical and practical study of different types of electronic equipment in the modern office.

ADOF 4025. OFFICE ADMINISTRATION PRACTICUM. Four credit hours. Eight hours of practice per week. Prerequisites: ADOF 3009, ADOF 3107, ADOF 4005, ADOF 4019, ADOF 4020, ADOF 4065, ADOF 4080 and 12 credits of professional electives or authorization of the Director of the Department.

Training in office techniques through the practice and performance of tasks pertaining to the office administration area in internship centers selected and supervised by the professor. Round-up and refine knowledge, techniques, skills, and attitudes desirable in a professional specialized in the office administration field.

ADOF 4055. INTERPERSONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4006 or GERH 4006 or ADMI 3009.

Study of the interpersonal relations and its impact on the work setting: structure and organization of the work setting and the skills required for human interaction.

ADOF 4065. INTRODUCTION OF WORD PROCESSING. Three credit hours. Three hours of lecture with practice per week. Prerequisites: ADOF 3016 or CISE 3049.

Basic concepts of word and information processing systems and their applications. Utilization of different word processing programs in a microcomputer.

ADOF 4075. INTEGRATION OF INFORMATION PROCESSING PROGRAMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3010 or ADOF 3107.

Advanced concepts, special applications, and integration of different programs with word processing software.

ADOF 4077. DESIGN AND PROCESSING OF DOCUMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 4005.

Design, composition and production of legal, governmental, medical, and industrial documents, among others, using the computer.

ADOF 4080. TRAINING AND SEMINAR PLANNING. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 4019 and (ADMI 3009 or ESOR 4006 or GERH 4006).

Development of competitions and coordination in the areas of office administration and supervision of personnel. Study and application of the basic concepts of planning and organization of trainings and seminars for the office personnel. Emphasis on the identification of necessities, selection of human and technological resources and the presentation of training proposals.

ADOF 4126. MULTIDISCIPLINARY BUSINESS SEMINAR. Three credit hours. Three hours of lecture-laboratory per week. Prerequisites: CONT 3011 and (ADOF 4005 or ADOF 4020) and (MATE 3086 or MATE 3171).

Introduction to the basics of financial management. Discussion of concepts and principles of descriptive statistics and discussion of the basics of entrepreneurship. Application of concepts in the preparation of an integrated plan in the business context.

ADOF 4995. OFFICE ADMINISTRATION INTERNSHIP. Zero to six credit hours. Prerequisites: ADOF 4005 and ADOF 3009 and ADOF 4020.

Work experience in the area of office administration, in an office or business enterprise, under the supervision of a faculty member and in coordination with an immediate supervisor at the workplace.

CISE 3049. KEYBOARDING AND TYPEWRITING. Three credit hours. Three hours of lecture per week.

Development of typewriting skills and the use of the keyboard on touch. Input of information to computers. Preparation of documents such as letters, memorandum, reports, tables, etc.

COLLEGE OF ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

INQU 3047. CHEMICAL PROCESS MANUFACTURING. Three credit hours. Three hours of lectures per week. Prerequisite: QUIM 3042 or QUIM 3002.

Introduction to the chemical plants manufacturing processes and raw materials processing at large scale of: chemicals, petroleum products, food, drugs, and wastes. Discussion of the chemical-process stem transformation of raw materials into desired end products, processing equipment, process flow diagram and schematic representation of the physical and chemical process interactions to carry out the overall transformation. Evaluation of the economic performance of different manufacturing options to reach the optimal or best solution. Evaluation of environmental, health and safety criteria as other considerations in the manufacturing steps. Discussion of ethical considerations in the manufacturing engineers profession.

INQU 4001. HEAT TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4010 and INQU 4011.

Heat transfer principles, including multidimensional flow and unsteady state conditions, radiation heat transfer, design of exchangers, empirical relations.

INQU 4002. MASS TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012.

Phase equilibria and equilibrium stage operations, with particular emphasis on distillation, gas absorption, humidification, and liquid-liquid extraction.

INQU 4005. MATERIALS AND ENERGY BALANCES. Four credit hours. Three hours of lecture and two hours of discussion per week. Corequisites: QUIM 4041 or QUIM 4057 or authorization of the Director of the Department.

An introduction to chemical engineering calculations involving the laws of conservation of mass and energy.

INQU 4008. MATHEMATICAL ANALYSIS OF CHEMICAL ENGINEERING PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4005 and MATE 4009.

Mathematical analysis of problems of interest in chemical engineering. Methods of interpretation and analysis of experimental data, formulation and solution of mass and energy balance equations in open and closed systems: use of Laplace transforms, error and Bessel functions, matrices, solution of problems by means of digital computers.

INQU 4010. MOMENTUM TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisite: INQU 4005. Corequisite: MATE 4009.

Introduction to mass, momentum and energy transport, and the calculation of transport coefficients. Shell momentum balances; analytical solution of problems in viscous flow; dimensional analysis. Introduction to turbulent flow. Friction factor in ducts and particulate systems. Macroscopic balances, application to the design of chemical engineering systems.

INQU 4011. CHEMICAL ENGINEERING THERMODYNAMICS I. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4005 and QUIM 4041 and (MATE 4009 or MATE 3048).

Thermodynamic principles; applications of the first and second laws of thermodynamics to the solution of chemical engineering problems; thermodynamic properties of fluids.

INQU 4012. CHEMICAL ENGINEERING THERMODYNAMICS II. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4011 and QUIM 4042 and INGE 3016.

Emphasis on thermodynamic functions, properties of solutions, phase equilibria, and chemical reacton equilibria.

INQU 4017. CHEMICAL ENGINEERING KINETICS AND CATALYSIS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012.

The principles of chemical kinetics and catalysis, and their application to reactor design and industrial processes.

INQU 4027. CHEMICAL ENGINEERING SEMINAR. One credit hour. One and one-half hour of seminar per week. Prerequisite: INQU 4010.

Discussion and reports on special topics in chemical engineering. Involves literature searches and evaluation for the preparation of written and oral reports. Students are required to attend all seminars sponsored by the Department of Chemical Engineering.

INQU 4029. PHARMACEUTICAL OPERATIONS. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: INME 4001 or INME 4045 or QUIM 4041.

Theory, principles and practices related with the manufacture of pharmaceutical preparations and pharmaceutical related plant and equipment design. Studies on key unit operations like powder weighing granulation, milling, blending and compressing. Plant and equipment validation and good manufacturing practices (GMP).

INQU 4034. CHEMICAL ENGINEERING LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: INQU 4001.

Experimental studies on fluid flow and heat transfer using pilot plant equipment.

INQU 4038. PROJECT MANAGEMENT FOR CHEMICAL ENGINEERS. Three credit hours. There hours of lecture per week. Prerequisite: INQU 4005.

Skills for successful management projects that require development, design, construction and operation of chemical plants and related industries.

INQU 4077. UNIT OPERATIONS IN FOOD PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012. Corequisite: INQU 4002.

Drying: tray, belt, drum, spray, freeze drying, instantanizing, and agglomeration. Freezing and freeze concentration. Membrane processes: osmosis, reverse osmosis, ultrafiltration, electrodialysis, Extrusion, Expression, Microwave heating.

INQU 4206. QUANTITATIVE FRAMEWORKS IN BIOLOGICAL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3016.

Study of fundamental concepts, technology, and utilization of living things in the context of engineering disciplines. Discussion of the interactions between a biological unit in its physical, chemical, and biological environments. Applications of engineering principles to the quantification of biological responses.

INQU 4207. BIOSEPARATION ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4005.

Study of the theory, applications, and design of the biochemical unit operations related to pretreatment of raw materials and product processing, such as filtration, sedimentation, extraction, chromatography, crystallization, mixing, and drying, amongst others.

INQU 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to nine credit hours. Prerequisites: INQU 4005 and authorization of the Director of the Department.

Practical experience in chemical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the coop program coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INQU 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate and Graduate Courses

INQU 5006. STATISTICAL METHODS FOR CHEMICAL ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisites: (INQU 4005 and (MATE 4009 or MATE 3048)) or authorization of the Director of the Department.

Statistical analysis of experimental data, curve fitting, and sampling theory; nomography; problem solving with digital computers. Emphasis is given to chemical engineering applications.

INQU 5015. FUNDAMENTALS OF AIR POLLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or authorization of the Director of the Department. Corequisite: INQU 4002.

Classification and extent of air pollution problems; meteorology and air pollution; dispersion from effluents; the effect of air pollution on plants and animals; visibility problems; socioeconomic impact of pollution problems; analytical and experimental sampling methods; equipment and process for abating air pollution; governmental regulations for air pollution control.

INQU 5018. AIR POLLUTION CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4010 or INCI 4008 or authorization of the Director of the Department.

A discussion of the theory, principles, and practices related to engineering control of particulate and gaseous emissions from natural, industrial, agricultural, commercial, and municipal sources of atmospheric pollution.

INQU 5019. INDUSTRIAL WASTE CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or authorization of the Director of the Department. Corequisite: INQU 4002.

The minimization of industrial wastes through the proper design and operation of manufacturing plants; treatment of disposal of industrial wastes, with emphasis on the chemical industries in Puerto Rico.

INQU 5020. CHEMICAL PROCESS SAFETY AND ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4001 or authorization of the Director of the Department.

Process safety and economic engineering analysis of chemical engineering unit operations and processes. Estimation of capital and manufacturing costs for engineering economic analysis and profitability analysis of chemical processes. Evaluation of the impact of chemical processing on the health and safety of people, and damage to the environment. Understanding of potential hazards and risk assessment associated with chemical processes and equipment. Analysis of process design and optimization.

INQU 5021. CHEMICAL ENGINEERING PROCESS DESIGN I. Three credit hours. Three hours of lecture per week. Corequisites: INQU 4002 and INQU 4017.

Analysis and design of chemical and biochemical process units, in particular, chemical reactors, mixers, separation units, heat exchangers, and transport of fluids.

INQU 5022. CHEMICAL ENGINEERING PROCESS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisites: (INQU 4017 and INQU 4002 and INQU 5021) or authorization of the Director of the Department.

Integration of chemical engineering concepts, economics, safety, ethics, and environmental considerations to plant and/or chemical process design.

INQU 5025. ANALYSIS AND CONTROL OF PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: (INQU 4017 and INQU 4002) or authorization of the Director of the Department.

Mathematical simulation of chemical and physical processes. Analysis of first and second order systems; control modes; control hardware; roots locus and frequency response analysis; optimum control settings; applications to the design of control systems.

INQU 5026. MICROCLIMATE AND DISPERSION OF AIR POLLUTANTS. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4002 or INCI 4008 or authorization of the Director of the Department.

Discussion of the elements of microclimate in urban, rural, and valley environments. Dispersion of air pollutants in these environments.

INQU 5029. BIOPROCESS ENGINEERING LABORATORY. Two credit hours. One hour of lecture and three hours of laboratory per week. Prerequisites: INQU 4207 or INQU 4003 or authorization of the Director of the Department.

Hands-on experiences in upstream and downstream bioprocess unit operations. Experiments in the areas of bioreactor cultures, cell and protein separation, as well as application of bioanalytical methods.

INQU 5030. CHEMICAL ENGINEERING LABORATORY II. Two credit hours. Two threehour laboratory periods per week. Prerequisite: (INQU 4002 and INQU 4017) or authorization of the Director of the Department. Corequisite: INQU 5025.

Experimental studies on mass transfer, process control, fermentation, kinetics and catalysis using pilot plant equipment at the Unit Operations Laboratory.

INQU 5035. BIOREACTOR ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4005 or authorization of the Director of the Department.

Fundamentals of biochemistry. Kinetics of enzyme reactors; growth kinetics of suspended cell cultures; consideration of transport phenomena in bioreactors; operation and control strategies of bioreactors; culture of genetically engineered cells to produce recombinant proteins of therapeutic value.

INQU 5036. PARTICULATE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4002 or authorization of the Director of the Department.

Creation, characterization, separation and agglomeration of particles. Sizing fractionation of powders, surface area and pore size determinations. Pulverization, crystallization, agglomeration, tableting and granulation.

INQU 5050. HAZARDOUS WASTE TREATMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4012 or INCI 4008 or authorization of the Director of the Department.

Introduction to the application of traditional and innovative technologies for the treatment of hazardous wastes in water and soil. Discussion of aspects such as: environmental regulations, design and operating parameters, and cost analysis. Use of computer software for the simulation and design of the different technologies.

INQU 5075. POLYMER ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: ((QUIM 3042 or QUIM 3132) and (INQU 4010 or INGE4010 or INGE4015)) or authorization of the Director of the Department.

Application of the principles of fluid mechanics, and heat and mass transfer to describe the production and processing of polymeric materials. Application of engineering principles to the analysis of polymer processes such as extrusion, molding and other industrially relevant unit operations. Emphasis on the effects of processing on structure and physical properties of polymers, and vice versa.

INQU 5076. POLYMER SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3042 or QUIM 3132 or authorization of the Director of the Department.

Analysis of the fundamental physical and chemical properties of polymers and their relevance in the synthesis, production and characterization of polymer-based materials. Discussion of polymerization and reaction kinetics of polymers and copolymers, structure and morphology in solution, melt, and solid phases, thermodynamics of polymers, solutions and blends, and molecular weight characterization.

INQU 5995. SPECIAL PROBLEMS. One to three credit hours. One to three laboratory, library or independent work periods per week. Prerequisite: authorization of the Director of the Department.

Undergraduate research problems in chemical engineering or related field. Topics vary with interest of student and instructor. Open only to outstanding Chemical Engineering students.

DEPARTMENT OF CIVIL ENGINEERING AND SURVEYING

INCI 3000. CONTEMPORARY ISSUES IN CIVIL ENGINEERING. One credit hour. Half hour of lecture and half hour of discussion per week.

Overview of the civil engineering career, technical areas and specialties, emergent issues, and technological innovations. Introduction of regulations, ethics, skills, and tools needed for the professional practice of civil engineers. Discussion of relations between the built infrastructures, society, economy, and natural environment to meet the challenges of the future.

INCI 4000. INTRODUCTION TO ARCHITECTURE. Three credit hours. Three hours of lecture per week.

The significance of architecture in relation to culture, the development of construction technology, and to the sociopolitical structure of the times. Relationship between the architect and the civil engineer in modern society. Elements of architectural design. Architectural analysis of different types of buildings. Anatomy of the building.

INCI 4001. GEOMATICS I. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: (INGE 3012 or INGE 3809 or INME 3809) and (MATE 3031).

Study of measurement of distances, angles and elevations; use of traverse and leveling equipment; measurement of traverses. Traverse, area, coordinates, elevation and subdivision computations. Systematic and random errors analysis.

INCI 4002. GEOMATICS II. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: INCI 4001. Corequisite: INGE 3016.

Study and application of topographic surveys; earthworks; control surveys (horizontal and vertical); coordinate systems; construction surveys; special topics in geomatics; software applications.

INCI 4005. AGRICULTURAL SURVEYING. Three credit hours. Two hours of lecture and one-three hour laboratory per week. Prerequisites: INGE 3011 and (MATE 3172 or MATE 3174 or MATE 3005 or MATE 3143).

Use and care of surveying instruments; measurement of distances, angles, areas, and volumes; subdivision of land; differential and profile leveling, topographic surveying and mapping, interpretation of aerial photographs; elements of legal land surveying.

INCI 4007. HIGHWAY LOCATION AND CURVE DESIGN. Three credit hours. Two hours of lecture and three hours of computation per week. Prerequisite: INCI 4002.

Highway location surveys; study and design of simple and compound circular, parabolic, and transition curves; earthwork; special project.

INCI 4008. ENVIRONMENTAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: ((INGE 4015 or INGE 4010) and QUIM 3131 and QUIM 3133) or INQU 4010.

Study of water quality and treatment methods; wastewater characteristics and pollution control processes; pollution effects on receiving water; marine outfall; air pollution control; solid waste management; noise pollution.

INCI 4011. STRUCTURAL STEEL DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021.

Basic methods of stress analysis and design of structural steel elements subjected to elastic and non-elastic stresses due to axial, bending and shearing loads.

INCI 4012. REINFORCED CONCRETE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4021 and (INCI 4035 or INCI 4231).

Seismic design of rectangular beams and columns in bending and shear; design of T-beams and one-way slabs; development length; design of joints and rectangular walls.

INCI 4018. INTEGRATED PRACTICE IN GEOMATICS. Four credit hours. Two hours of lecture and four hours of practice per week. Prerequisites: Approved at least five (5) of the eight (8) Program core courses of the following list: (INCI 4061 or INCI 4078 or INCI 4086 or INCI 4087 or INCI 4081 or INCI 4085 or INCI 4059 or INCI 4007).

Comprehensive practice in geomatics utilizing research techniques, design, data compilation, analysis and mapping learned throughout the program's curriculum to complete a capstone project. The course will address and apply the ethical and legal standards of the geomatics profession.

INCI 4019. CIVIL ENGINEERING SEMINAR. One credit hour. One hour of lecture per week. Prerequisites: 40 credits approved in INCI or authorization of the Director of the Department.

Presentation and discussion of topics on Civil Engineering by students, faculty members or guest speakers.

INCI 4021. STRUCTURAL ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4012 or INGE 4019.

Basic principles and theorems of structural analysis, strain energy concepts, simple structures, trusses, graphic statics, influence lines.

INCI 4022. STRUCTURAL ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021.

Analysis of statically indeterminate structures using prismatic and non-prismatic elements by the methods of slope-deflection and moment distribution. Approximate analysis of multistory structures.

INCI 4026. HIGHWAY ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4211 or INCI 4007.

Performance-based design and assessment of highways. Road safety analysis and identification of preventive strategies countermeasures. Roadside design and characteristics of safety barriers. Properties of traffic control devices and preparation of temporary traffic control plans. Layer design of pavements and maintenance and rehabilitation techniques of in-service pavements.

INCI 4035. CIVIL ENGINEERING MATERIALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INGE 4001.

Engineering application of the physico-chemical properties of materials; aggregate fundamentals; selection of materials, and their structural behavior; test principles and methods applied to concrete, steel, wood, aluminum, asphaltic and other construction materials, failure analysis; specifications.

INCI 4049. FOUNDATIONS ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4139 or INCI 4241.

Evaluation of subsoil conditions as they affect the choice of type of foundation. Analysis and dimensioning of shallow and deep foundations in sands and clays. Study of lateral earth pressures. Analysis and dimensioning of retaining walls.

INCI 4051. GEODESY I. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4002.

Triangulations, spherical coordinates computation. Legendre's theorem, traverses, leveling, and orthometric and dynamic elevations.

INCI 4052. GEODESY II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4051.

The shape of the earth, the spheroid and ellipsoid; dimensions of the ellipsoid; radius of curvature in the prime vertical plane and in the normal section at any azimuth; computation of angles and distances on the ellipsoid; the geodesic line.

INCI 4055. CONSTRUCTION ENGINEERING AND MANAGEMENT I. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3016.

Study of the construction project lifecycle process from the initial conceptual design phase of a project through to the completion of the pre-construction phase with emphasis on the project management aspects of the lifecycle.

INCI 4056. CONSTRUCTION ENGINEERING AND MANAGEMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4055.

Study of the construction project lifecycle process from the initial steps of the construction phase of a project through to the project closeout with emphasis on the construction engineering and project management aspects of the lifecycle.

INCI 4057. CIVIL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: authorization of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in Civil Engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INCI 4059. GEODETIC ASTRONOMY. Three credit hours. Two hours of conference and one two-hour laboratory per week. Prerequisite: INCI 4051 and ASTR 4005.

Geodetic methods for determining latitude, longitude, and azimuth of second and third order.

INCI 4061. LEGAL ASPECTS I. Three credit hours. Three hours of lecture per week. Pre-requisite: third year students.

Laws of the Board of Examiners of Engineers, Architects, Surveyors and Landscape Architects of Puerto Rico, the College of Engineers and Surveyors of P.R. (CIAPR), Code of Ethics of the CIAPR, etc.

INCI 4062. LEGAL ASPECTS II. Three credit hours. Three hours of lecture per week. Corequisite: INCI 4002.

A study of those laws of Puerto Rico which rule land ownership, land transfer, and land use.

INCI 4071. ADJUSTMENT COMPUTATION I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4051 and (MATE 3063 or MATE 3185).

Theory and analysis of random errors, normal distribution, adjustment of simple triangulation and leveling networks by condition and observation equations, least squares.

INCI 4072. ADJUSTMENT COMPUTATION II. Three credit hours. One lecture and two two-hour periods of computation per week. Prerequisite: INCI 4071.

Solution of normal equations; Cholesky's method; adjustment of leveling and triangulation networks; method of variation of coordinates; Lagrangian multipliers; trisection and intersection adjustment.

INCI 4078. TOPOGRAPHIC DRAWING. Two credit hours. One hour of lecture and three-hour laboratory or computation per week. Prerequisite: INCI 4002.

The plane table, drawing, interpretation and utilization of topographic maps; volume computation.

INCI 4079. PHOTO INTERPRETATION. Three credit hours. One lecture and two two-hour periods of computation or laboratory per week. Prerequisite: GEOL 4015.

Analysis and interpretation of patterns in aerial photography: color tones and vegetation, geologic formation, erosion, soil and rock types, drainage, and other engineering works.

INCI 4081. PHOTOGRAMMETRY I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4002 and INCI 4135.

Geometry of aerial photographs, determination of distances and coordinates, elevations by radial displacement, stereoscopy, and parallax.

INCI 4082. PHOTOGRAMMETRY II. Three credit hours. One hour of lecture and two two-hour periods of computation or laboratory per week. Prerequisite: INCI 4081.

Flight planning and photographic control; theory of stereo plotters of the second and third order; introduction to analytical photogrammetry.

INCI 4085. THEORY OF MAP PROJECTIONS. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4051 and (MATE 3063 or MATE 3185).

Mathematical analysis of map projections, the Lambert conformal conic projection of Puerto Rico.

INCI 4086. INTRODUCTION TO PHYSICAL GEODESY. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4071.

The shape of the earth, the geoid, gravimetry, Stokes' theorem applied to the determination of the shape of the earth, isostatic equilibrium.

INCI 4087. SPECIAL SURVEYS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4002.

Techniques and equipment used in topographic surveys, hydrography, mine surveys, optical tooling, electronic distance measurements.

INCI 4088. CARTOGRAPHY. Three credit hours. Three hours of lecture per week.

History of maps; scales and projections, symbols; map reproduction, map types and their uses.

INCI 4095. MATHEMATICAL METHODS IN CIVIL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: INGE 3016 and (MATE 3063 or MATE 3185).

Numerical and statistical methods applied in the solution of Civil Engineering problems using computers.

INCI 4125. INTRODUCTION TO LAND INFORMATION SYSTEMS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: MATE 3171 or MATE 3005 or MATE 3143.

Methods for the acquisition and conversion data to be used in a Land Information System (LIS) for later analysis. Different types of data structures, including databases in a LIS. Emphasis in vector-based systems. Observe the benefits of a land information system in Puerto Rico.

INCI 4135. ELEMENTS OF OPTICS AND REMOTE SENSING IN GEOSPATIAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3172 or FISI 3162.

Principles of geometrical optics and remote sensing applied to Geospatial Science. Acquisition, handling, and interpretation of geospatial data acquired at different portions of the electromagnetic spectrum.

INCI 4136. APPLIED STATISTICS FOR CIVIL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Application of probability and statistical theory in civil engineering. Probability fundamentals; continuous and discrete distributions; point and interval estimation; test of hypothesis; multiple regression.

INCI 4137. TRANSPORTATION ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4136 or INCI 4236.

Introduction to fundamentals of transportation systems, travel demand forecasting, and evaluation of transportation alternatives. Study of traffic flow theory and its applications, as well as basic concepts of transportation operations, including the design of traffic signals and the performance analysis of transportation facilities.

INCI 4138. WATER RESOURCES ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4015 or INQU 4010 or INGE 4010.

Hydrologic measurements; hydrographs; probability theory applied to hydrologic computations; well hydraulics; capacity of reservoirs and stability of dams; hydraulics of open channels and of pressure conduits; flood control; legal and economic aspects of water resources.

INCI 4139. INTRODUCTION TO GEOTECHNICAL ENGINEERING. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: INGE 4011 and (INGE 4015 or INQU 4010 or INGE 4010). Corequisite: GEOL 4015.

Sampling, identification and description of soils; index and hydraulic properties; interaction between mineral particles and water; permeability and seepage; stress-strain and consolidation characteristics of soils; shear strength determinations. Stress distribution and soil improvement.

INCI 4145. WATERWORKS AND SEWERAGE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138.

Design of water transmission, distribution, and collection systems. Analysis of flow in pipe networks, head losses, pressure distribution; system configuration; sewer hydraulics; quantities of water, sewage, and storm flows used in design; design of water supply systems, sanitary and storm sewers, and pumping stations.

INCI 4146. INFORMATION TECHNOLOGY APPLICATIONS IN CONSTRUCTION. One credit hour. Three hours of laboratory per week. Prerequisite: INCI 4055.

Introduction to the main applications of information technology used in construction. Laboratory practice of information technology applications in the construction process. Applications related to project and facilities management, construction cost estimating, construction planning and scheduling, productivity, information storage and retrieval are presented. In addition, contracts, specifications, visualization and modeling are included.

INCI 4147. FUNDAMENTALS OF INTEGRATED PRACTICE FOR RESILIENT AND SUSTAINABLE INFRASTRUCTURE. Three credit hours. Three hours of lecture per week.

The course focuses on the implications of natural disasters on the design and construction processes, including the human factors, for solving problems of the design team. Study of the relevant dimensions for resilient and sustainable design and construction solutions, from the perspective of integrated practice and the integrated production of projects (Integrated Project Delivery / IPD).

INCI 4148. TRANSPORTATION ENGINEERING STUDIES. One credit hour. Three hours of laboratory per week. Corequisite: INCI 4137.

Studies performed by civil engineers to characterize, analyze, simulate, and estimate the performance, service quality, and condition of transportation systems. Discussion of the techniques of data collection and analysis. Demonstration of software applications used to plan, evaluate, operate, and maintain transportation systems. Implementation of strategies to present data and communicate results for transportation systems.

INCI 4201. LAND SURVEYING AND PLAN READING. Two credit hours. Two hours of lecture per week. Prerequisites: (INGE 3012 or INGE 3809 or INME 3809) and MATE 3031. Corequisite: INCI 4202.

Study and application of land surveying concepts to determine distances, angles, directions, elevations, areas, volumes, and other spatial measurements; use and interpretation of topographic maps and digital elevation models; image georeferencing and coordinate systems; plan and profile views; earthwork volume computations; grading and site development.

INCI 4202. LAND SURVEYING AND PLAN READING LABORATORY. One credit hour. Three hours of laboratory per week. Corequisite: INCI 4201.

Land surveying graphical and computational methods for determining distances, angles, directions, elevations, areas, volumes, and other spatial measurements; use and interpretation of topographic maps and digital elevation models; image georeferencing and coordinate systems; plan and profile views; earthwork volume computations; grading and site development.

INCI 4211. LOCATION AND DESIGN LINEAR PROJECTS. Two credit hours. Two hours of lecture per week. Prerequisite: INCI 4201 or INCI 4002.

Principles of route location and geometric design of linear projects. Project development from preliminary route conception to the final design of horizontal and vertical alignments, including calculations of simple and compound circular curves, spiral curves, and parabolic curves, transition segments, cross-section areas and volumes, and earthwork analysis. Evaluation of route alternatives using multi-criteria methods.

INCI 4212. LOCATION AND DESIGN OF LINEAR PROJECTS LABORATORY. One credit hour. Three hours of laboratory per week. Corequisite: INCI 4211.

Application of route location and geometric design concepts of linear projects. Demonstration of computer-aided design (CAD) software tools for the preparation of technical drawings and plans of components of a linear project, from the preliminary route conception to the final design decisions for the horizontal and vertical alignments, selection of typical sections, computation of curves, transition sections, elevations, cross-section areas and volumes, and earthwork analysis.

INCI 4231. CIVIL ENGINEERING MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3131 and QUIM 3133 and (INGE 4019 or INGE 4011).

Introduction to the production, properties, selection, applications of construction materials in civil engineering, including physical, chemical, and mechanical properties, structural behavior, specifications and standards, experimental tests and measurements applied to concrete, steel, wood, aluminum, asphalt, and other construction materials.

INCI 4232. CIVIL ENGINEERING MATERIALS LABORATORY. One credit hour. Three hours of laboratory per week. Prerequisite: INCI 4231.

Experimental evaluation of the physical, chemical and mechanical properties of civil engineering materials. Processing and reporting experimental data using spreadsheets, laboratory measuring devices, interpretation and application of the American Society for Testing and Materials (ASTM) standards.

INCI 4236. PROBABILITY AND STATISTICS IN CIVIL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032.

Introduction to probability and statistical theory and their applications to Civil Engineering; descriptive statistics; probability foundations; continuous and discrete distributions; point and interval estimation; hypothesis testing; linear regression; goodness of fit.

INCI 4241. GEOTECHNICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (INGE 4011 or INGE 4019) and (INGE 4015 or INGE 4010 or INQU 4010). Corequisite: GEOL 4015.

Foundations of Geotechnical Engineering associated to the sampling, identification and description of soils. Study of index and hydraulic properties; interaction between mineral particles and water; permeability and seepage; stress-strain and consolidation characteristics of soils; shear strength determinations; stress distribution and soil improvement.

INCI 4242. GEOTECHNICAL ENGINEERING LABORATORY. One credit hour. Three hours of laboratory per week. Corequisite: INCI 4241.

Experimental evaluation for the application of fundamentals and concepts of geotechnical engineering. Demonstrations and practical hands-on exercises on the sampling, identification and description of soils; index and hydraulic properties; interaction between mineral particles and water; permeability and seepage; stress-strain and consolidation characteristics of soils; shear strength determinations; stress distribution and soil improvement.

INCI 4950. INTEGRATED CIVIL ENGINEERING PROJECT. Three credit hours. One hour of lecture and five hours of practice per week. Prerequisite: (No more than 19 remaining credits to fulfill graduation requirements) and authorization of the Director of the Department.

Design of a civil engineering project, integrating subdisciplines of the profession. Development of a project from its inception, and a conceptual and preliminary design, to its final design. Development of design alternatives, including computational methodology, plans, cost estimates, and specifications following sustainable, resilient, and universal design principles.

INCI 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Three to nine credit hours. Prerequisites: authorization of the Director of the Department. Be registered in the Civil Engineering or Surveying program.

Practical experience in Civil Engineering in cooperation with a Company or agency to be jointly supervised by the academic department, the coop program coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work and its corresponding final grade will be given at the end of each period**.**

INCI 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate and Graduate Courses

INCI 5006. APPLIED HYDRAULICS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138 or authorization of the Director of the Department.

Dimensional analysis and modeling; hydraulic machinery and structures; steady conduit and open channel flow; pipe network system.

INCI 5007. SOLID WASTE MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or authorization of the Director of the Department.

The solid waste problem: volume reduction and storage of solid wastes, design and optimization of collection systems, recycling, integrated treatment and disposal systems.

INCI 5008. INTRODUCTION TO HYDROLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138 or authorization of the Director of the Department.

The elements of the hydrologic cycle; probability theory and commonly used probability distributions in hydrology: hydrologic and hydraulic flood routing analysis; use of hydrologic concepts in design.

INCI 5009. FUNDAMENTALS OF AIR POLLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or authorization of the Director of the Department.

Classification and extent of air pollution problems, its effects on plants, animals, visibility, and its socio-economic impact; dispersion of effluents; analytical and experimental sampling methods.

INCI 5010. SUSTAINABLE AND RESILIENT DESIGN AND CONSTRUCTION. Three credit hours. Three hours of lecture per week. Prerequisites: Fifth year student or authorization of the Director of the Department.

Discussion of sustainable development. Application of sustainability and resiliency to engineering design and construction. Discussion of the engineering and ethical principles needed to support green and resilient design and construction. Discussion of the process to deliver and assess green and resilient construction, the construction system for resource optimization, the reduction of environmental impact, and the use of the integrated building design to achieve sustainability and resiliency.

INCI 5012. APPLIED SANITARY ENGINEERING CHEMISTRY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: INCI 4008 or authorization of the Director of the Department.

The application of chemical principles to the sanitary engineering field. Physical, chemical, and biochemical analysis of water and wastewater. Interpretation of analytical data. Integration of experimental data into the design process. The preparation of laboratory reports in the form of engineering reports is emphasized.

INCI 5015. WATER TREATMENT AND POLLUTION CONTROL. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: INCI 4008 or authorization of the Director of the Department.

Study of water and wastewater treatment processes in terms of the underlying physical, chemical, and biological principles; the application of the principles to the study of unit treatment processes and to the design, operation, and analysis of performance of integrated treatment plants; the influence of the self-purification of natural bodies of water and of the planned use of the resources on the type and degree of treatment of waste and its disposal; wastewater reclamation.

INCI 5017. PRESTRESSED CONCRETE STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4012 or authorization of the Director of the Department. Corequisite: INCI 4022.

Prestressing systems and materials; stress losses, design of beams for flexure, bond, shear and bearing; current specifications and economics of design.

INCI 5018. MATRIX ANALYSIS OF STRUCTURES I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4022 and authorization of the Director of the Department.

Use of matrix methods in the analysis of structures; flexibility and stiffness methods.

INCI 5019. DESIGN OF REINFORCED MASONRY STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4012 or authorization of the Director of the Department.

Analysis and design of reinforced and unreinforced masonry structures using advanced analytical techniques and design philosophies. Includes topics such as: material properties, stability, and buckling of unreinforced masonry; flexural strength, stiffness, and ductility of reinforced masonry elements; and seismic and wind load design provisions.

INCI 5021. INTRODUCTION TO DYNAMICS OF STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4022 or authorization of the Director of the Department.

Study of the modeling of structures as systems of single and multiple degrees of freedom. Explanation of the calculation of natural frequencies and vibration modes. Use of computer programs for the dynamic analysis of structures. Introduction of the concept of response and design spectra along with their use for the calculation of the response to earthquake loads.

INCI 5026 BRIDGE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: (INCI 4012 and INCI 4022) or authorization of the Director of the Department.

Bridge analysis and design; bridge types, characteristics; design problems.

INCI 5027. MODEL ANALYSIS OF STRUCTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INCI 4022 or authorization of the Director of the Department.

Model analysis in structural engineering; similarity of structures; theory of models of trussed and framed structures and shells; direct and indirect model analysis of structures.

INCI 5029. PRINCIPLES OF CITY PLANNING. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

The scope of and legislative bases for planning, organization of planning agencies, basic studies for studies for planning, public utilities and related service facilities, transit and transportation systems, recreation and related service facilities, transit and transportation systems, recreation and public spaces, land use planning, zoning, land subdivision regulations, economic and social aspects of planning, local, regional and national levels of planning.

INCI 5036. DESIGN-BUILD PROJECT DELIVERY. Three credit hours. Three hours of lecture per week.

Discussion of the design-build project delivery process. Analysis of the dynamics of the Design-Build process for the development of resilient and sustainable infrastructure. Use of management techniques to capitalize on Design-Build's potential. Application of procurement methods that require interdisciplinary, resilient, and sustainable approaches.

INCI 5037. MANAGEMENT OF CONSTRUCTION ENGINEERING PROJECTS. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4056 or authorization of the Director of the Department.

Study of the project management knowledge areas required to effectively manage construction engineering projects. Discussion of tools and best practices used in the construction industry for successful project management.

INCI 5047. INTRODUCTION TO ROCK MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139 or INCI 4031 or authorization of the Director of the Department.

Fundamentals of rock mechanics: properties of rocks; strength and deformation characteristics of intact and in-situ rocks, computation of internal stresses in a rock mass; methods of rock exploration; application of rock mechanics.

INCI 5049. GEOSYNTHETICS IN CIVIL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139 or authorization of the Director of the Department.

Manufacture, properties and test methods of the different products which comprise the geosynthetics. Applications in: drainage and filtration, design of pavements, earth retaining structures, systems of pollution control, sanitary landfills and other environmental projects.

INCI 5055. DESIGN OF TIMBER STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021 or authorization of the Director of the Department.

Physical and mechanical properties of solid and laminated wood; design and behavior of flexural, tension, and compression members; design of timber connections and mechanical fasteners; special problems in the design of wood trusses, shear walls, diaphragms and plywood composite beams.

INCI 5056. STRUCTURAL ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4022 or authorization of the Director of the Department.

Application of methods for analysis of statically indeterminate structures. Moment distribution. Slope deflection and energy theorems.

INCI 5057. DESIGN OF REINFORCED CONCRETE STRUCTURES. Three credit hours. Two hours of conference and one hour of computation per week. Prerequisites: (INCI 4012 and INCI 4022) or authorization of the Director of the Department.

Design of concrete buildings, review of the design of slabs, beams and columns applied to buildings using the new seismic design codes, design of two-way slab systems, shear walls, typical foundations, retaining walls and design for torsion. Discussion of examples related to a complete structural design of a multistory building including the preparation of construction drawings.

INCI 5065. PRODUCTION OF BITUMINOUS MATERIALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INGE 4001 or authorization of the Director of the Department. Corequisite: INCI 4035 or authorization of the Director of the Department.

Study of the production of bituminous materials, the distillation process, and products applicable to the construction and rehabilitarion of flexible pavements. Laboratory tests and trials for the characterization of such materials according to current standards. Design of bituminous mixtures for different types of pavement construction.

INCI 5146. INTRODUCTION TO TRAFFIC ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4137 or authorization of the Director of the Department.

Operation and geometric analysis and design of intersections. Interrupted traffic flow theory, queuing theory, capacity and level of service, traffic studies, service models for signalized intersections and traffic simulation models.

INCI 5995. SPECIAL TOPICS. One to six credit hours. The contact will vary according to the topic to be presented. Prerequisite: authorization of the Director of the Department.

The topics will be presented by visiting professors and members of the department who are specialists in the field to be covered. The selection and scope of the topics shall be in accordance with the interests and needs of the students.

INCI 5996. SPECIAL PROBLEMS. One to six credit hours. The contact will vary according to the topic to be presented. Prerequisite: authorization of the Director of the Department.

Research and special problems in Civil Engineering and related fields. Open to outstanding students in the field of Civil Engineering.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CIIC 3015. INTRODUCTION TO COMPUTER PROGRAMMING I. Four credit hours. Three hours of lecture and two hours of laboratory per week.

Analysis of algorithmic problems, development of solutions, and their implementation in a high level programming language using object-oriented programming techniques. Topics: numerical systems, internal representation, constants, variables, and data types, selection, and iteration control structures, functions, and data passing mechanisms, basic data structures, pointers, and dynamic memory management, data input/output, files, and software development environments.

CIIC 3075. FUNDAMENTALS OF COMPUTING. Three credit hours. Three hours of lecture per week. Prerequisites: CIIC 3015 or CIIC 3011 or INGE 3016.

Discrete structures in computer sciences and engineering with emphasis on problem-solving skills and algorithms. Topics include: set theory, logic and proof techniques, graph theory, computability, and discrete probability applied to computing problems.

CIIC 3081. COMPUTER ARCHITECTURE I. Three credit hours. Three hours of lecture per week. Prerequisites: CIIC 3015 or CIIC 3011 or INGE 3016. Corequisite: INEL 4115.

Study of fundamental concepts of logic circuit analysis and design with the aim of understanding and designing the main components of a modern processor. Topics include: boolean algebra, logic gates, combinational and sequential circuits, arithmetic logic units (alu), memory and programmable logic devices, data paths, and control units. Practice with logic circuit design problems.

CIIC 4010. ADVANCED PROGRAMMING. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: CIIC 3015 or CIIC 3011 or INGE 3016.

Advanced programming techniques applied to the solution of engineering problems, extensive use of subprograms, logical and specifications statements. Principles of multiprogramming, multiprocessing, and real-time systems.

CIIC 4020. DATA STRUCTURES. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: (CIIC 4010 or ICOM 4015) and (CIIC 3075 or ICOM 4075). Corequisite: MATE 3031.

Data structures in programming languages; representation of information as data lists in linear, orthogonal, string, and array form; tree structures; techniques for storage allocation, distribution collection, and sorting of data.

CIIC 4025. ANALYSIS AND DESIGN OF ALGORITHMS. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or CIIC 4020.

Study of methods and techniques for the complexity analysis of computer algorithms. Design of new algorithms capable of minimizing execution time while optimizing the use of computer resources. Topics include: asymptotic analysis, greedy strategies, divide and conquer, dynamic programming, backtracking, and graph, search, and sorting algorithms.

CIIC 4030. PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035 or CIIC 4020.

Comparative study of programming paradigms including imperative, object-oriented, functional, logic, and concurrent programming; data encapsulation and inheritance; formal specification of the syntactic structure of a language; context-free grammars and parse trees.

CIIC 4050. OPERATING SYSTEMS. Four credit hours. Three hours of lecture and three hours of laboratory per week. Prerequisites: (ICOM 4035 or CIIC 4020) and (CIIC 4082 or INEL 4206).

Study of operating systems, multiprogramming, multiprocessing, batch, partitioned, and real time processing, organization and processing of file systems, queuing theory and information flow control.

CIIC 4060. DATABASE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or CIIC 4020. Corequisites: ICOM 5007 or CIIC 4050.

Study of database system architectures, design and implementation of database applications, conceptual and representational models, SQL and the relational model, functional dependencies and normalization, transaction processing.

CIIC 4070. COMPUTER NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisites: CIIC 4020 or ICOM 4035. Corequisite: CIIC 4050 or ICOM 5007.

Study and development of skills required for the design of network protocols and network-centric applications, with emphasis on internet protocols. Topics include: the iso layered model, TCP/IP, routing, client-server model, World Wide Web, and web services. Practice with analysis and programming problems.

CIIC 4082. COMPUTER ARCHITECTURE II. Three credit hours. Three hours of lecture per week. Prerequisite: CIIC 3081.

Study of fundamental computer architecture concepts with the objective of designing efficient processors and computing systems to support operating systems and high-level programming languages. Topics include: subroutines, exceptions, input/output, pipelining, and hierarchical memories. Practice with analysis, design, and programming problems.

CIIC 4151. SENIOR DESIGN PROJECT (CAPSTONE). Three credit hours. Three hours of lecture per week. Prerequisites: (CIIC 4025 and CIIC 4060 and INSO 4101) or authorization of the Director of the Department.

Team project to design, implement, test, and document a system based on Computer Systems and Computer Architecture techniques, incorporating computer science standards, engineering standards and problem constraints.

CIIC 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to six credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in Computer Science and Engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an official from the cooperating organization.

CIIC 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Prerequisite: ICOM 4035 or CIIC 4020 and authorization of the Director of the Department.

Development of a research project in computer science and computer engineering under the supervision of a faculty member.

CIIC 5015. ARTIFICIAL INTELLIGENCE. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or CIIC 4020.

An introduction to the field of artificial intelligence: Lisp language, search techniques, games, vision, representation of knowledge, inference and process of proving theorems, natural language understanding.

CIIC 5017. OPERATING SYSTEM AND NETWORK ADMINISTRATION AND SECURITY. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: CIIC 4070 or ICOM 5026.

Practical experience in the administration and security of operating systems and networks. Design and development of measures for the detection and response to attacks on such systems.

CIIC 5018. CRYPTOGRAPHY AND NETWORK SECURITY. Three credit hours. Three hours of lecture per week. Prerequisites: CIIC 4050 or ICOM 5007.

Theoretical and practical aspects of computing system and network security, threat models, system vulnerability to attacks such as: hackers, malicious code, Trojan horses, viruses, and worms, cryptographic techniques used to defend systems from such attacks.

CIIC 5019. HIGH PERFORMANCE COMPUTING. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or CIIC 4020 or authorization of the Director of the Department.

Study of the fundamentals concepts associated with the performance of a computing systems. Discussion of techniques for the reduction of operations with the aim of minimizing the response time of a system to problems whose solution poses a high demand of computational resources. Study of parallelization, and concurrency strategies, and practical experiences with the use of systems and tools implementing them.

CIIC 5029. COMPILERS DEVELOPMENT. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisites: CIIC 4082 or INEL 4206. Corequisites: CIIC 4030 or ICOM 4036.

Study and application of techniques associated with the analysis of source languages and the generation of efficient object codes with emphasis on the components of a compiler.

CIIC 5045. AUTOMATA AND FORMAL LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisites: CIIC 4020 or ICOM 4035 or authorization of the Director of the Department.

Study of theoretical computational models, languages, and machines. Introduction to the theory of intractable and un-decidable problems. Topics include: finite automata, regular languages, context-free languages, pushdown automata, turing machine, halting problem, undecidability, and intractable problems.

CIIC 5110. BIOINFORMATICS ALGORITHMS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4010 and (ICOM 4038 or CIIC 4025 or authorization of the Director of the Department).

Discussion of algorithms for processing genomic and proteomic data. Discussion of heuristic randomized and non-heuristic algorithmic solutions for sequence comparison, gene finding and gene expression state determination problems, among others. Discussion of algorithmic design principles and their impacts on time and space complexity and the quality of results.

CIIC 5120. VIRTUAL MACHINES. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 5007 or CIIC 4050 or authorization of the Director of the Department.

Discussion of concepts related to the design and implementation of virtual computer monitors, including traditional computer virtualization techniques such as “trap-and-emulate”, translation of binary files, “shadow page tables” and principles of emulation of devices. Discussion of classic publications in the area of virtualization and recent advances in the subject.

CIIC 5130. CLOUD COMPUTING INFRASTRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisites: ((CIIC 4060 or ICOM 5016) and (CIIC 4070 or ICOM 5026) or authorization of the Director of the Department).

Description of the principles of cloud computing. Discussion of the virtualization, load balancing in the system, scalability and elasticity, replication and deployment. Design and programming of applications in the cloud. Discussion of advanced aspects of cloud computing including security and software performance evaluation. Discussion of the use of cloud infrastructure for areas such as health, transportation, energy and education.

CIIC 5140. BIG DATA ANALYTICS. Three credit hours. Three hours of lecture per week. Prerequisites: ((CIIC 4060 or ICOM 5016) and ININ 4010) or authorization of the Director of the Department.

Description of the principles of big data systems and analysis techniques for the design of cloud computing processes. Discussion of the implementation of parallel algorithms to process data on cloud-resident storage and memory-based file systems.

CIIC 5150. MACHINE LEARNING ALGORITHMS. Three credit hours. Three hours of lecture per week. Prerequisites: (ININ 4010 and CIIC 4020) or authorization of the Director of the Department.

Development of machine learning algorithms and programs using supervised and unsupervised learning methods following different strategies. Use of software libraries and frameworks by implementing computational models of directed graphs in distributed systems and graphical processing units ("GPU"). Graphical visualization of data and results using data manipulation tools and their respective data sources. Discussion of recent research publications in machine learning and their application in industry and academia.

CIIC 5995. SELECTED TOPICS. One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in computer science and engineering.

SOFTWARE ENGINEERING

INSO 4101. INTRODUCTION TO SOFTWARE ENGINEERING. Three credit hour. Three hours of lecture per week. Prerequisite: ICOM 4035 or CIIC 4020.

Introduction to the activities of the software development cycle. Software development process models and related metrics. Ethical issues in software engineering.

INSO 4115. SOFTWARE ENGINEERING REQUIREMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4009 or INSO 4101.

Techniques used to determine the requirements of a complex software system: specification standards, the UML language, validation, specification management tools, and quality metrics. Elicitation and development of software system requirements. Discussion of ethical issues arising during requirements elicitation.

INSO 4116. SOFTWARE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INSO 4101 or ICOM 4009.

Fundamental principles and development of skills required for the effective design of complex software systems. Topics include: formal design methods, design specification standards, design patterns, design validation, and design metrics. Use of computer-aided software engineering (CASE) tools.

INSO 4117. SOFTWARE RELIABILITY TESTING. Three credit hours. Three hours of lecture per week. Prerequisites: INSO 4101 or ICOM 4009.

Software testing and validation techniques with the aim of developing the skills required to design reliable and fault-tolerant software systems. Topics include: unit, integrated, performance, stress, usability, and fault tolerance testing. Practice with computerized testing and debugging tools.

INSO 4151. SOFTWARE ENGINEERING PROJECT I. Three credit hours. Three hours of lecture per week. Prerequisites: (INSO 4115 and INSO 4116 and INSO 4117 and CIIC 4025 and CIIC 4060) or authorization of the Director of the Department.

Team project to implement a previously designed system of software engineering development to solve an academic, governmental, commercial, or industrial problem. Final presentation and evaluation of the project.

INSO 4152. SOFTWARE ENGINEERING PROJECT II. Three credit hours. Three hours of discussion per week. Prerequisite: INSO 4151.

Team project to implement a previously designed system of software engineering development to solve an academic, governmental, commercial, or industrial problem. Final presentation and evaluation of the project.

INSO 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to six credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in Software Engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an official from the cooperating organization.

INSO 4998. UNDERGRADUATE RESEARCH IN SOFTWARE ENGINEERING. One to three credit hours. One to three hours of research per week. Prerequisites: authorization of the Director of the Department.

Development of a research project related to Software Engineering, under the supervision of a faculty member.

Advanced Undergraduate and Graduate Courses

INSO 5111. INTRODUCTION TO HUMAN-COMPUTER INTERACTION. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or CIIC 4020 or authorization of the Director of the Department.

Introduction to the principles of human-computer interaction with the objective of developing the skills necessary to design and implement graphical user interfaces (GUI). Topics include: cognitive psychology, human factors, and interaction styles. Practice in designing and evaluating the usability of various graphical user interfaces.

INSO 5118. SOFTWARE ENGINEERING PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: INSO 4101 or ICOM 4009 or authorization of the Director of the Department.

Discussion of techniques and tools for estimation, planning, monitoring, documentation, evaluation, refinement, and quality control of software. Development of skills for the effective administration of complex software engineering projects. Practice in project administration.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ELECTRICAL ENGINEERING

INEL 3105. ELECTRICAL SYSTEMS ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisite: (MATE 3032 or MATE 3184) and INGE 3016. Corequisites: (FISI 3172 or FISI 3162) and (MATE 3063 or MATE 3185).

Analysis of direct current and alternating current linear electric circuits; laws and concepts that characterize their behavior.

INEL 3115. INTRODUCTION TO ELECTRICAL ENGINEERING. Two credit hours. One hour of conference and one two-hour laboratory per week. Prerequisite: First year student of Electrical Engineering program.

Basic concepts and applications in the live areas of specialization in electrical engineering: control systems, communications, electronics, power and applied electromagnetic. Exposure to basic tools in preparation for electrical engineering courses. Experiments in the five areas of specialization with design experiences.

INEL 4021. COMMUNICATION SYSTEM THEORY I. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4095 and ININ 4010.

Elements of Signal Transmission theory; random signals and noise; introduction to modulation theory.

INEL 4048. ELECTRICAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: authorization of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in electrical engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INEL 4075. FUNDAMENTALS OF ELECTRICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (FISI 3172 or FISI 3162). (Not for electrical or computer engineering students).

Laws and fundamental concepts that govern the behavior of electric and magnetic circuits; ideal models of resistors, voltage and current sources, capacitors and inductors; three-phase circuits and transformers.

INEL 4076. FUNDAMENTALS OF ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4075.

Fundamentals and applications of analog and digital electronics.

INEL 4077. BASIC ELECTRONICS LABORATORY. One credit hour. One three-hour laboratory per week. Corequisite: INEL 4076.

Description and use of basic equipment for electrical measurements in digital and analog circuits.

INEL 4078. FUNDAMENTALS OF CIRCUITS AND ELECTRONICS. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: FISI 3172 or FISI 3162.

Introduction to electrical and electronic basic elements, as well as analysis of linear circuits. Discussion of special elements for applications, such as sensors, relays, and others. Analysis and design of combinatorial and sequential logic circuits, as well as applications.

INEL 4085. FUNDAMENTALS OF TRANSFORMERS AND ELECTRIC MACHINERY. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4075.

Electromechanical energy converters such as transformers; induction, synchronous and direct current machines; distribution systems where these converters are used.

INEL 4086. TRANSFORMERS AND ELECTRIC MACHINERY LABORATORY. One credit hour. One three-hour laboratory per week. Corequisite: INEL 4085. (Not for electrical or computer engineering students).

Voltage, current electrical and mechanical power measurements and other parameters related to the operation of single phase, three phase, and direct current equipment.

INEL 4095. SIGNALS AND SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4102 and MATE 4009.

Introduction to the mathematical representation of analog and discrete signals and systems. Study of Fourier series, the Fourier transform, and the Z transform applied to analog and discrete signals. Sampling of analog signals. Analysis of signals and frequency response of linear systems. Characterization of linear time-invariant systems of analog and discrete signals.

INEL 4102. ELECTRICAL SYSTEMS ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 3105 and (FISI 3172 or FISI 3162) and INGE 3016. Corequisite: MATE 4009.

Network functions; circuit analysis by LAPLACE transforms and Fourier Series; two-port networks; Butterworth and Chebyshev filters; computer-aided analysis of these systems.

INEL 4103. ELECTRICAL SYSTEMS ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009, INEL 4102 and INEL 4151.

Analysis of magnetic circuits and polyphase balanced systems; transformers; power transmission lines; computer-aided analysis of these systems.

INEL 4115. ELECTRICAL MEASUREMENTS LABORATORY. One credit hour. One two-hour laboratory per week. Corequisite: INEL 3105.

Experiments with electronic components and equipment; measurement techniques.

INEL 4151. ELECTROMAGNETICS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (FISI 3172 or FISI 3162). Corequisite: MATE 4009.

Static and time-varying electric and magnetic fields; dielectric, magnetic and conducting materials; capacitance, inductance and conductivity; magnetic circuits; dielectric and magnetic hysteresis; Maxwell's equations; wave equation.

INEL 4155. APPLIED ENGINEERING ELECTROMAGNETICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009 and INEL 4151.

Introduction to wave polarization, wave reflection and transmission at oblique incidence. Analysis of transmission lines, impedance matching and smith chart. Explanation of microstrip lines and two port network s-parameters. Analysis of waveguides, antennas and radar systems.

INEL 4156. APPLIED ELECTROMAGNETICS LABORATORIES. One credit hour. One two hour of laboratory per week. Corequisites: INEL 4152 or INEL 4155.

Demonstration of fundamental concepts in applied electromagnetic.

INEL 4201. ELECTRONICS I. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 3105 and (FISI 3172 or FISI 3162).

Semiconductor device characteristics: semiconductor diodes, bipolar junction transistors and field effect transistors; analysis of basic digital circuits; analysis and design considerations of transistor amplifiers; introduction to integrated circuits.

INEL 4202. ELECTRONICS II. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 and INEL 4102.

Analysis and design of multi-stage amplifiers, wave generation and power circuits; operational amplifier characteristics and applications.

INEL 4205. LOGIC CIRCUITS. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3016.

Boolean algebra, its theorems and postulates. Design of combinational circuits; minimization and reduction techniques, use of medium or large scale integration (MSI/LSI) in digital circuit design; analysis and design of sequential circuits; practical design considerations.

INEL 4206. MICROPROCESSORS AND EMBEDDED SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4205 and INEL 4201.

Architecture, organization and operation of embedded systems and their supporting devices: design of microprocessor/microcontroller-based systems.

INEL 4207. DIGITAL ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4201 and INEL 4205.

Theory of operation of transistor-transistor logic (TTL) and metal-oxide-semiconductor (MOS) gates; operation of semiconductor memories; programmable logic arrays (PLA); operational amplifiers; multivibrators; analog gates; analog to digital (A/D) and digital to analog (D/A) converters.

INEL 4211. ELECTRONICS LABORATORY I. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4115. Corequisite: INEL 4201.

Experiments with basic amplifiers and digital circuits. Design and testing of simple electronic circuits.

INEL 4212. ELECTRONICS LABORATORY II. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4211. Corequisite: INEL 4202.

Experiments and projects with electronic circuits emphasizing their design.

INEL 4218. INTEGRATED CIRCUIT ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 and INGE 3045 and INEL 4205.

Basic concepts of integrated circuits with emphasis on very large scale integration (VLSI). Description of the steps associated with the design, modeling, simulation, and fabrication of silicon integrated circuitry pertaining to metal-oxide-semiconductor (MOS) and bipolar technologies.

INEL 4225. DIGITAL ELECTRONICS LABORATORY. One credit hour. One three-hour laboratory per week. Co-requisite: INEL 4207.

Experiments with digital electronics and analog circuits.

INEL 4301. COMMUNICATIONS THEORY I. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4102 and ININ 4010.

Components and communications systems; Fourier transform analysis of filtered signals; NYQUIST theorem; analog to digital and digital to analog conversion processes; bandwidth; modulation and noise. Computer-aided analysis.

INEL 4307. COMMUNICATION BETWEEN COMPUTERS. Three credit hours. Three hours of lecture per week. Prerequisites: (INEL 4095 or INEL 4301) and INEL 4206 and (ININ 4010 or ININ 4011).

Computer network organization. Characteristics of voice grade channels used for digital communication. Synchronization ad Multiplexing. Information codes and interfacing standards and protocols. Data encryption techniques. Distributed computing and local area networks.

INEL/ICOM 4308. NETWORKING AND ROUTING FUNDAMENTALS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3063 or authorization of the Director of the Department.

Study of the terminology of computer networks and their protocols, IP protocol addressing, and networking standards. Introduction to network design. Discussion and configuration of several routing protocols.

INEL 4405. ELECTRIC MACHINES. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103.

Electromechanical energy conversion; induction, synchronous and direct current machines.

INEL 4406. ELECTRIC MACHINES LABORATORY. One credit hour. One three-hours of laboratory per week. Prerequisites: INEL 4115 and INEL 4103.

Magnetic circuits; single phase transformers; three phase systems: load and transformers; single-phase and three-phase induction motors.

INEL 4407. ELECTRICAL SYSTEMS DESIGN I. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103 or INEL 4075.

Design of electrical systems for buildings; wiring systems, illumination, protection and grounding.

INEL 4408. ELECTRICAL SYSTEMS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4407.

Design of electrical systems for buildings: exterior illumination, signal systems, and emergency/ standby power equipment.

INEL 4409. ILLUMINATION ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103 or INEL 4075.

Interior and exterior illumination design. Development and application of methods on illumination techniques.

INEL 4415. POWER SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103. Corequisite: INEL 4405.

Formulation of bus admittance and bus impedance matrices; symmetrical components; symmetrical and unsymmetrical faults; load flow; economic operation of power systems.

INEL 4416. POWER ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 and INEL 4103.

Design of circuits for rectification, inversion, frequency conversion, direct current (D.C.) and alternating current (A.C.) machines control, and other non-motor applications using solid state power devices.

INEL 4417. ALTERNATIVE POWER GENERATION. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4416. Co-requisite: INEL 4505.

Design of alternative power generation systems. Study of energy conservation and reuse, passive conservation, combined cycles, and cogeneration.

INEL 4418. POWER ELECTRONICS LABORATORY. One credit hour. One three hours of laboratory per week.

Design, control and practical experience in power electronics.

INEL 4505. INTRODUCTION TO CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4102 and MATE 4009.

Analysis of control systems and their mathematical models; analysis and design of control systems for single-input single-output plants; computer solution of problems will be emphasized.

INEL 4995. ELECTRICAL ENGINEERING PRACTICE FOR CO-OP STUDENTS. Zero to nine credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in electrical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INEL 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate and Graduate Courses

INEL 5046. MACHINE LEARNING AND PATTERN RECOGNITION. Three credit hours. Three hours of lecture per week. Prerequisites: (INEL 4095 or INEL 4301) and (ININ 4010 or ININ 4011) or authorization of the Director of the Department.

Introduction to the field of pattern recognition, including statistical decision making, nonparametric decision making, clustering techniques, artificial neural networks, learning techniques, evaluation of classification rules, and image analysis.

INEL 5195. DESIGN PROJECT IN ELECTRICAL ENGINEERING. Three credit hours. One hour of lecture and four hours of laboratory per week. Prerequisite: authorization of the Director of the Department.

Capstone design course in which students apply the fundamental knowledge in electrical engineering to solve engineering problems considering engineering standards and realistic design constraints.

INEL 5205. INSTRUMENTATION. Three credit hours. Three hours of lecture per week. Prerequisites: (INEL 4201 and INEL 4206) or authorization of the Director of the Department.

Signals from transducers; signal conditioning, data conversion and transmission; effects of noise. Data storage and display; use of microprocessors in instrumentation.

INEL 5206. DIGITAL SYSTEMS DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4207 or authorization of the Director of the Department.

Design methods in combinational and sequential systems. Use of programmable logic devices in digital systems design. Analysis and design of system controllers.

INEL 5207. ANALOG SYSTEMS DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: (INEL 4201 and INEL 4205) or authorization of the Director of the Department.

This course covers the design of applications using analog integrated circuits. A discussion on the characteristics of operational amplifiers is followed with a detailed overview of applications.

INEL 5208. PRINCIPLES OF BIOMEDICAL INSTRUMENTS. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisite: INEL 4202 or authorization of the Director of the Department.

Theoretical and practical aspects of the methods used to measure physiological events with emphasis in the cardiovascular, pulmonary, and nervous systems.

INEL 5209. INTRODUCTION TO SOLID STATE ELECTRONICS. Three credit hours. Three hours of conference per week. Prerequisite: authorization of the Director of the Department.

Basic operation principles of solid state electronic devices, physical phenomena and properties of solid materials involved in the analysis and design of such devices, detailed treatment of the most common elements used as diodes, transistor and controlled rectifiers.

INEL 5218. INTRODUCTION TO MIXED-SIGNAL TESTING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 or authorization of the Director of the Department.

Description and analysis of tester hardware, sampling theory for Digital Signal Processing (DSP), analog channels and sample channel testing, including testing for mixed signal circuits focused on A/D and D/A converters, focused calibration and test economics.

INEL 5265. ANALOG INTEGRATED CIRCUIT DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4201 or authorization of the Director of the Department.

Analysis and design of analog and mixed-technology (analog-digital) circuits through the use of advanced computer-assisted design (CAD) techniques. Discussion of functional tests of analog integrated circuits.

INEL 5307. OPTICAL COMMUNICATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4301 or authorization of the Director of the Department.

Optical communication principles; transmitter and receiver design; fiber optic channels.

INEL 5309. DIGITAL SIGNAL PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4095 or authorization of the Director of the Department.

Signal classification, Z-Transform and discrete Fourier transform; matrix representation of digital filters and digital systems; digital filter design; discrete Fourier transform algorithms.

INEL 5315. THEORY OF COMMUNICATIONS II. Three credit hours. Three hours of lecture per week. Prerequisite: (INEL 4301 and (ININ 4011 or ININ 4010)) or authorization of the Director of the Department.

Information theory; coding theory; signal design; noise and probability of error.

INEL/ICOM/SICI/COMP 5318. INTERMEDIATE ROUTING, SWITCHING AND WIDE AREA NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL/ICOM/SICI/COMP 4308 or authorization of the Director of the Department.

Study and configuration of link state protocols. Study of intermediate level concepts such as switching, wide area network or WAN standards, virtual local area networks or VLAN, network design, and redundancy. Presentation and study of strategies for managing and saving address space such as variable length subnet masks and network address translation.

INEL 5326. COMMUNICATION SYSTEM DESIGN: SIGNAL PROCESSING. Three credit hours. One hour of lecture and two two-hour laboratories per week. Prerequisite: INEL 5309 or authorization of the Director of the Department.

Block diagram design and simulation of communication systems. Design projects including: specification, evaluation and selection of alternatives, and implementation. Computer and laboratory work and written reports required.

INEL 5327. IMAGE PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4095 or INEL 5309 or ICOM 4045 or authorization of the Director of the Department.

Mathematical representation of two dimensional digital signals. Two-dimensional filter design, image coding, image filtering, enhancement, and compression.

INEL 5406. DESIGN OF TRANSMISSION AND DISTRIBUTION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4415 or authorization of the Director of the Department.

Generation, transmission, and distribution of electric power. Reliability consumer services; overhead and underground lines.

INEL 5407. COMPUTER AIDED POWER SYSTEM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4415 or authorization of the Director of the Department.

Design of power systems using digital computers; load flow, economic load dispatch, symmetrical and unsymmetrical faults. Selection of breakers.

INEL 5408. ELECTRICAL MOTORS CONTROL. Three credit hours. Three hours of lecture per week. Prerequisites: (INEL 4405 and INEL 4416 and INEL 4505) or authorization of the Director of the Department.

Characteristics and selection criteria of alternating current (A.C.) and direct current (D.C.) motors; design and control of solid state drive systems; breaking methods; heating and duty cycle calculations. Performance calculations and design of closed loop controllers.

INEL 5415. PROTECTION DESIGN FOR ELECTRICAL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4415 or authorization of the Director of the Department.

Design and selection of protective devices used in electrical generation, transmission, and distribution systems such as: relays, fuses, breakers, reclosers, and arresters. Selection of other system components such as sectionalizers and throwovers. Protection and insulation coordination.

INEL 5417. POWER ELECTRONICS APPLIED TO RENEWABLE ENERGY SYSTEM. Thee credit hours. Three hours of lecture per week. Prerequisite: INEL 4416 or authorization of the Director of the Department.

Design of interfaces using topologies based on power electronics for photovoltaic and wind applications. Use of algorithms for maximum power point tracking; control of photovoltaic and wind systems, and its applications.

INEL 5505. LINEAR SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4505 or authorization of the Director of the Department.

Linear spaces and matrices; state variables representations for linear continuous and discrete systems; the Z-transform and its application; controllability and observability; state estimators; stability.

INEL 5506. PROCESS INSTRUMENTATION AND CONTROL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: (INEL 4505 and INEL 4206) or authorization of the Director of the Department.

Design of process instrumentation and control systems, based on analog and digital instruments and mini or microcomputers. Standards and practical considerations emphasized.

INEL 5508. DIGITAL CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4505 or authorization of the Director of the Department.

Analysis and design of digital control systems; stability, controllability and observability of discrete systems. Practical considerations when implementing a digital control system.

INEL 5516. AUTOMATION AND ROBOTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4206 or ININ 4057 or authorization of the Director of the Department.

Analysis and design of automated pneumatic systems using programmable controllers. Programming of industrial robots.

INEL 5605. ANTENNA THEORY AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: ((INEL 4155 or INEL 4152) and (INEL 4095 or INEL 4301)) or authorization of the Director of the Department.

Radiation mechanism. Types of antennas; impedance; radiation patterns; antenna arrays. Antenna measurements.

INEL 5606. MICROWAVE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: ((INEL 4155 or INEL 4152) and (INEL 4095 or INEL 4301)) or authorization of the Director of the Department.

Rectangular and circular waveguides; passive components, tubes, and solid-state devices components, tubes, and solid-state devices used in microwave systems.

INEL 5608. RADIO FREQUENCIES (RF) SPECTRUM MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4151 or authorization of the Director of the Department.

Analysis of the most relevant issues related to the RF spectrum management, including regulations at national and international levels, the geophysical fundamentals of wave propagation, the power budget equation, engineering

aspects about antennas and active and passive sensors, introduction to the services that use the spectrum (satellite communications, radio astronomy, Earth exploration) and the agencies that regulate them.

INEL 5616. WIRELESS COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisites: ((INEL 4155 or INEL 4152) and (INEL 4095 or INEL 4301)) or authorization of the Director of the Department.

Study of cellular radio and personal wireless communications, multiple access techniques for the efficient use of the radio spectrum, and wide-area wireless systems. Description of some wireless systems and their standards. Effects of EM radiation on health. Development of modulation and diversity methods to facilitate signal transmission and to improve quality of reception.

INEL 5625. COMMUNICATION SYSTEM DESIGN: CIRCUITS AND ANTENNAS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 5306 or INEL 5305 or authorization of the Director of the Department.

Design of communication circuits and antennas. Several design projects including: specification, evaluation and selection of alternatives and implementation. Written reports and computer use required.

INEL 5995. SPECIAL PROBLEMS. One to six credit hours. Prerequisite: Authorization of the Director of the Department.

Investigations and special problems in Electrical Engineering or related fields, open to outstanding Electrical Engineering students.

COMPUTER ENGINEERING

ICOM 4009. SOFTWARE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Techniques used during the software development cycle; specification, design, testing, documentation and maintenance. Use of a procedure oriented language in the design and implementation of a software project.

ICOM 4015. ADVANCED PROGRAMMING. Three credit hours. Three hours of lecture and one two hour laboratory per week. Prerequisite: INGE 3016.

Advanced programming techniques applied to the solution of engineering problems; extensive use of subprograms, logical and specification statements. Principles of multiprogramming, multiprocessing, and real-time systems.

ICOM 4017. COMPUTER-BASED INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Analysis and design of computer-based management information systems; communication theory and the flow of information within organizations; methods and procedures of gathering, disseminating and controlling information; integrated Electronic Data Processing versus batch-controlled system; the development and installation of information processing systems.

ICOM 4029. COMPILER CONSTRUCTION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: ICOM 4036.

Techniques involved in the analysis of source languages and the generation of efficient object codes with emphasis on the components of a compiler.

ICOM 4035. DATA STRUCTURES. Three credit hours. Three hours of lecture per week and one two hour laboratory per week. Prerequisite: ICOM 4015 and MATE 3031 and ICOM 4075.

Data structures in programming languages, representation of information as data. List in linear, orthogonal, strings and array distribution, collection, and sorting data. Tree structures. Techniques for storage allocation, distribution, collection, and sorting data.

ICOM 4036. STRUCTURE AND PROPERTIES OF PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Comparative study of programming styles, including imperative, object-oriented, functional, logic, and concurrent programming. Concepts of data encapsulation and inheritance. Formal specification of the syntactic structure of a language. Context-free grammars and parse trees.

ICOM 4038. ALGORITHM DESIGN AND ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Study of asymptotic analysis of mathematical expressions and strategies to derive closed-form solutions of recurrence equations, Intractability, NP-completeness, and their application to estimating the runtime or space requirements of algorithms. Strategies for designing correct and efficient algorithms. Emphasis on the study of algorithms for sorting, searching, string processing, operations on graphs, optimization problems, and numerical processes.

ICOM 4046. DIGITAL PROCESSING OF SIGNALS. Three credit hours. Three hours of lecture per week. Prerequisite: (INEL 4301 and INEL 4205).

The Z transform and Discrete-Signals; the Discrete Fourier transform; the Fast Fourier Transform; Digital Filter Design.

ICOM 4048. PRACTICAL EXPERIENCE IN COMPUTER ENGINEERING. Three credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in computer engineering projects in cooperation with an organization to be supervised jointly by a member of the department and an appropriate official from the cooperating organization. Oral and written reports are required.

ICOM 4066. SOFTWARE PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4009.

Discussion of techniques and tools for estimation, planning, monitoring, documentation, evaluation, refinement, and quality control of software. Development of skills for the effective administration of complex software engineering projects. Practice in project administration.

ICOM 4075. FOUNDATIONS OF COMPUTING. Three credit hours. Three hours of lecture per week. Corequisites: INGE 3016.

Discussion of mathematical foundations frequently encountered in computer science and engineering, with an emphasis in problem solving, algorithms and computing models. Topics include relationships between data and sets, proof techniques, operators and functions, basic logic and circuits, graph theory and organization of computational processes, elements of discrete probability and random events as they appear in computing. Examples from across the computing discipline are used to illustrate the underlying mathematical foundations.

ICOM 4215. COMPUTER ARQUITECTURE AND ORGANIZATION. Three credit hours. Three hours of conference per week. Prerequisite: INEL 4206.

Arquitectural aspects of general purpose computers: instruction sets, addressing models, data types, registers, support for programming languages and operating systems. Comparative study of commercial arquitectures. Organizational aspects of general purpose computers: central processing unit, microprogramming, arithmetic and logic units, memory systems, input/output systems.

ICOM 4217. EMBEDDED SYSTEMS DESIGN. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisite: INEL 4206 and INEL 4207 or authorization of the Director of the Department.

Development of microprocessor based systems for embedded applications. Interfacing of peripherals such as displays, keypads, digital-to-analog and analog-to-digital converters among others. Hardware and software design will be emphasized.

INEL/ICOM 4308. NETWORKING AND ROUTING FUNDAMENTALS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3063 or authorization of the Director of the Department.

Study of the terminology of computer networks and their protocols, IP protocol addressing, and networking standards. Introduction to network design. Discussion and configuration of several routing protocols.

ICOM 4995. COMPUTER ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to nine credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in computer engineering in cooperation with an organization to be supervised jointly by the academic department, the COOP Program Coordinator, and a representative from the cooperating organization.

ICOM 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate and Graduate Courses

ICOM 5007. OPERATING SYSTEMS PROGRAMMING. Four credit hours. Three hours of lecture and one-three hour laboratory per week. Prerequisites: (ICOM 4035 and INEL 4206) or authorization of the Director of the Department.

Concepts of operating systems, multiprogramming, multiprocessing, batch, partitioned, and real time. Organizational and processing of file systems. Study of queueing theory and information flow control.

ICOM/COMP 5015. ARTIFICIAL INTELLIGENCE. Three credit hours. Three hours of conference per week. Prerequisite: ICOM 4035.

An introduction to the field of artificial intelligence: LISP language, search techniques, games, vision, representation of knowledge, inference and process of proving theorems, natural language understanding.

ICOM 5016. DATABASE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035 or authorization of the Director of the Department.

Study of database system architectures; design and implementation of database applications; conceptual and representational models; SQL and the relational model; functional dependencies and normalization; transaction processing.

ICOM 5017. OPERATING SYSTEM AND NETWORK ADMINISTRATION AND SECURITY. Three credit hours. Two hours of lectrure and one three-hour laboratory per week. Prerequisite: (INEL 4307 and ICOM 5007) or authorization of the Director of the Department.

Practical experience in the administration and security of operating systems and networks. Design and development of measures for the detection of and response to attacks on such systems.

ICOM 5018. CRYPTOGRAPHY AND NETWORK SECURITY. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 5007 or authorization of the Director of the Department.

Study of the theoretical and practical aspects of computer systems and network security. Threat models and vulnerabilities of computer systems and networks to attacks such as: hackers, malicious code, Trojan horses, viruses, and worms. Methods and techniques to defend against attacks and minimize their damage. Cryptographic techniques, physical and operational security policies, and management-related issues.

ICOM 5025. OBJECT-ORIENTED SOFTWARE DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisites: ICOM 4035 or authorization of the Director of the Department.

Discussion of the fundamendal concepts of object-oriented programming. Analysis, design, and development of object-oriented software. Study of object-oriented languages.

ICOM 5026.COMPUTER NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 5007 or authorization of the Director of the Department.

Study of computer communication including the OSI and Internet layering models and networking protocols at subnetwork, network, transport, and application layers. Analysis of media and standards applied to computer networks as well as the software, hardware, and terminology associated with data communications.

ICOM 5035. COMPUTER GRAPHICS. Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: ICOM 4035 or authorization of the Director of the Department.

The analysis, creation and rendering of 3D models and animations using computer graphics: geometric modeling and transformations, rendering algorithms, animation, illumination models, image formation, antialiasing, and ray tracing.

ICOM 5047. COMPUTER ENGINEERING DESIGN. Three credit hours. One hour of lecture and four hours of laboratory per week. Prerequisites: ((ICOM 4009 or ICOM 5016) and (ICOM 4217 or INEL 5206 or INEL 5265) and ICOM 4215 and ICOM 5007 and INEL 4301 and INEL 4207) or authorization of the Director of the Department.

Capstone course in which student teams design a project to solve a complete computer engineering problem considering engineering standards and realistic constraints. The project should integrate both hardware and software concepts.

ICOM 5104. COMPUTATIONAL SYSTEMS BIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (ICOM 5016 and INGE 5036) or authorization of the Director of the Department.

Study of fundamental concepts, models and computational methods for the analysis of biological networks. Discussion of theoretical foundations of networks and their use in biology systems modeling and simulation. Construction of networks from data and qualitative methods for their dynamic simulations and systems analysis.

INEL/ICOM/SICI/COMP 5318. INTERMEDIATE ROUTING, SWITCHING AND WIDE AREA NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL/ICOM/SICI/COMP 4308 or authorization of the Director of the Department.

Study and configuration of link state protocols. Study of intermediate level concepts such as switching, wide area network or WAN standards, virtual local area networks or VLAN, network design, and redundancy. Presentation and

study of strategies for managing and saving address space such as variable length subnet masks and network address translation.

ICOM 5995. SPECIAL PROBLEMS. One to six credit hours. Two to four hours of research per week per credit. Prerequisite: authorization of the Director of the Department.

Research and problem-solving in computer engineering or related fields.

DEPARTMENT OF ENGINEERING SCIENCES AND MATERIALS

FUNDAMENTAL ENGINEERING SCIENCES

INGE 3011. ENGINEERING GRAPHICS I. Two credit hours. One hour of lecture and two one-and-one-half-hour laboratories per week.

Principles of graphic language: Fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied in engineering. Freehand drawing as a tool for visualization. Principles of orthographic projection, sections, auxiliary views and conventional practices. Pictorial drawings: axonometric, oblique and perspective. Introduction to descriptive geometry. Hand and computer-aided drawing.

INGE 3012. ENGINEERING GRAPHICS II. Two credit hours. Two two-hours of lecture-drawing periods per week. Prerequisite: INGE 3011.

Underlying principles of the graphic language: fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied to engineering, spatial geometry: distances between planes and lines, angles between lines and planes, rotation problems. Introduction to graphical mathematics and nomography.

INGE 3016. ALGORITHMS AND COMPUTER PROGRAMMING. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3005 or MATE 3143 or MATE 3172 or MATE 3174.

Development of algorithms and their implementation in a structured high level language. Programming techniques applied to the solution of engineering and mathematical problems.

INGE 3017. COMPUTED AIDED GRAPHICS. Two credit hours. Two two-hour lecture-laboratory per week.

Fundamentals of computer aided graphics in engineering. Description of the equipment, use of commercial solid modeling programs, modeling of geometric figures and documentation.

INGE 3025. INTRODUCTION TO COMPUTERS. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183.

Fundamental principles of programming and use of computers with special emphasis on digital computers. Application to engineering problems.

INGE 3031. ENGINEERING MECHANICS STATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183.

Analysis of force systems; the laws of equilibrium; analysis of simple structures; distributed loads; friction; centroids and moments of inertia.

INGE 3032. ENGINEERING MECHANICS DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3031 and (FISI 3161 or FISI 3171).

Kinematics of particles and rigid bodies; relations among force, mass and acceleration; kinetics of particles and rigid bodies; work and energy; impulse and momentum.

INGE 3035. ENGINEERING MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183. Corequisite: FISI 3161 or FISI 3171.

Analysis of force systems; the laws of equilibrium; friction; centroids and moments of inertia. Kinematics and dynamics of particles and rigid bodies.

INGE 3045. MATERIALS SCIENCE FOR ELECTRICAL ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134). Corequisite: FISI 3162 or FISI 3172.

Principles that determine the properties of conductors, semiconductors, and insulators. Electromechanical properties; diffusion, electrical conduction, thermal conduction; magnetic and optical properties.

INGE/INME 3809. CREATIVE DESIGN I. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Introduction to the underlying principles and methodologies of engineering graphics communications, as a tool for the solution of engineering problems: Fundamentals of graphic visualization, sketching, PC-based Computer-Aided-Design (CAD), and technical presentations. An introduction to computer-aided-design software will include principles of parametric solid modes of mechanical parts and assemblies including dimensions and tolerances. Solid modeling is the tool for visualization, and analysis of engineering problems.

INGE 4001. ENGINEERING MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042) or (QUIM 3132 and QUIM 3134)) and (FISI 3161 or FISI 3171).

A study of the basic principles that govern the properties and behavior of engineering materials; atomic structures, interatomic forces, amorphous and crystalline structures; phase transformations; mechanical properties; the study of the capabilities and limitations of different materials; metals, polymers, ceramics and composites; introduction to corrosion.

INGE 4008. INTERDISCIPLINARY APPROACHES TO PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4085.

Study and application of the fundamental techniques of project management. Participation in the management of an actual public or private project using and interdisciplinary approach. Field work required.

INGE 4010. FLUID MECHANICS (WITH LABORATORY). Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: INGE 3032 and MATE 3063.

Study of fluid mechanics, the development of its fundamental equations, and its applications. Dimensional analysis and similitude between models and prototypes, non-viscous and viscous flows, and internal and external flows. Laboratory practice is included on phenomena and properties of fluids, hydrostratics, hydrodynamics, turbomachinery, and compressible flow.

INGE 4011. MECHANICS OF MATERIALS I. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3031 and (MATE 3032 or MATE 3184).

Stresses and strains due to axial, torsional, and bending loads; shear and moment diagrams.

INGE 4012. MECHANICS OF MATERIALS II. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4011 and (MATE 3063 or MATE 3185).

Analysis of statically determinate and indeterminate beams; stresses due to combined loads; stress and strain transformation; column theory.

INGE 4015. FLUID MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3032 and (MATE 3063 or MATE 3185).

Elements of mechanics of fluids and fluid statics. Development of the fundamental equations of fluid mechanics and its applications. Introduction to dimensional analysis and similitude. Motion of ideal and real fluids including internal and external viscous flows. Introduction to the use of hydraulic machinery.

INGE 4016. FLUID MECHANICS LABORATORY. One credit hour. One three-hour laboratory period per week. Corequisite: INGE 4015.

Laboratory work supplementing classroom instruction in mechanics of fluid phenomena, measuring devices and techniques, and the testing of fluid machinery.

INGE 4019. INTRODUCTION TO MECHANICS OF MATERIALS. Four credit hours. Four hours of lecture per week. Prerequisites: INGE 3031 and MATE 3063.

Stresses and strains due to axial, torsional, and flexural loads; shear and moment diagrams; stress and strains transformations; stresses due to combined loadings.

INGE 4035. NUMERICAL METHODS APPLIED TO ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3016 and (MATE 3063 or MATE 3185).

Discussion and application of numerical mathematical methods for engineering analysis. Use of software for the application of numerical methods for modeling experimental data, finding roots or equations, function interpolation, curve fitting, numerical differentiation and integration, solution of systems of linear and nonlinear equations; and the solution of ordinary and partial differential equations.

INGE/INME 4046. FUNDAMENTALS OF VIBRATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3032. Co-requisite: MATE 4009.

Study of the theory of vibration for single- and two-degree-of freedom systems. Free vibration analysis, response to harmonic and non-harmonic excitations, design for vibration control, and introduction to matrix analysis of multi-degree-of-freedom systems.

INGE 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to nine credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in Engineering in cooperation with private industry or government to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the cooperating entity (company).

INGE 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate Course

INGE 5005. STABILITY AND PROCESSING OF MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4001 or INGE 3045 or INME 4107 or authorization of the Director of the Department.

Discussion of materials' stability driven by thermodynamics and kinetics considerations such as microstructural evolution and interparticle interactions. Discussion of interfaces and their roles during materials syntheses and processing at different stages. Discussion of governing and operational phenomena at multi-length scales during synthesis and processing (ranging from nanomaterials to bulk materials processing) such as diffusion, sintering, and solidification.

INGE 5015. THEORY AND MANAGEMENT OF SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: third year standing or higher or authorization of the Director of the Department.

Introduction to the systems approach and to systems analysis. Analytical methods applicable to interactive contexts, such as economic and ecological systems and to organizations. Topics include: Problem formulation, information management, evaluation and selection of alternatives, implementation and monitoring of solutions.

INGE 5016. INTRODUCTION TO MATERIALS CHARACTERIZATION. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4001 or INGE 3045 or INME 4107 or authorization of the Director of the Department.

Discussion of the theory and practice of micro-characterization techniques, including optical microscopy, thermal analysis, electron beam diffraction, and x-ray and photon-induced interactions. Explanation of the complementary surface analysis techniques as experimental methods for design and selection of metals, polymers, composites and biological materials.

INGE 5020. INTRODUCTION TO CERAMIC MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4001 or INGE 3045 or INME 4107 or authorization of the Director of the Department.

Introduction to the fundamental principles of ceramic materials including their crystalline structure, electronic and ionic defects and subsequent transport phenomena, microstructure, mechanical properties, processing and diverse modern applications. Study of related topics such as glass formation and applications of nanostructured ceramic materials.

INGE 5027. OCEAN WAVE DYNAMICS FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4015 or authorization of the Director of the Department.

Analysis of surface waves focused on the engineering applications of ocean wave dynamics. Discussion and application of the physical and mathematical fundamentals which govern the behavior of ocean waves. Application of statistics and extreme wave analysis to develop design wave criteria.

INGE 5028. ENGINEERING VIBRATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE-INME 4046 and (INGE 4019 or INGE 4012) or authorization of the Director of the Department.

Discussion of the vibration theory of discrete and continuous systems. Use of techniques, principles and methodology to solve practical problems of engineering vibrations with an emphasis on analytical tools and computational approaches. Analysis of modeling and response of discrete and continuous systems; use of matrix methods for the solution of discrete systems; use of eigenvalue problem analysis for discrete and continuous systems; use of numerical methods in vibration analysis; applications of finite element methods for the analysis of vibrations of systems and nonlinear vibrations.

INGE 5037. APPLIED SIGNAL PROCESSING FOR ENGINEERING MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisites: (INGE 3016 and MATE 3063) or authorization of the Director of the Department.

Practical introduction to signal processing, including time-domain, frequency-domain, and time-frequency domain approaches. Development of skills to manipulate, analyze, and extract useful and reliable information from different types of signals. Practical applications of methods and principles including signal de-noising, outlier analysis, vibration based system identification, irregularities detection, system health monitoring and non-stationary signals characterization.

INGE 5040. ENGINEERING ACOUSTICS. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 4009 and (INGE 3032 or INGE 3035)) or authorization of the Director of the Department.

Basic acoustics theory and practice, modeling of acoustic sources, sound propagation and transmission, acoustics measurements, sound in enclosed spaces, design of sound enclosures and barriers and design of muffling devices.

INGE 5065. MATERIALS SELECTION. Three credit hours. Two hour of lecture and two hours of laboratory per week. Prerequisites: INGE 3045 or INGE 4001 or INME 4107 or authorization of the Director of the Department.

Discussion of the concepts, tools, and procedures related to the materials selection process to provide the conceptual basis needed for the decision-making process in the selection of materials in engineering applications. Use of materials selection software. Discussion of engineering materials and their structure-property-performance relationship. Use of case studies for the application of basic concepts in materials selection and the application of materials selection charts. Discussion of multiple constraints and compound objectives. The concepts of process selection as well as aesthetics and industrial design will also be discussed.

INGE 5066. RECYCLING OF MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4001 or INGE 3045 or INME 4007 or authorization of the Director of the Department.

Analysis of the recycling situation in the global context and its laws and regulations. Design of separation and collection centers for recyclable waste materials including electronic devices, aluminum cans, bottles, plastics, steel, tires, construction debris, and hazardous wastes. Planning of processing facilities.

INGE 5075. NANOMATERIALS AND FINE PARTICLES PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4001 or INGE 3045 or INME 4007 or authorization of the Director of the Department.

Study of the nanoscale and the perspective of nanotechnology, nanomaterials, and their properties. Fundamentals and practice of particle nucleation and growth. Analysis of conditions leading to particle stability and the formation of solid solutions at the micro- and nanosize scale. Fundamental and industrial applications such as ceramics, magnetic materials, semiconductors, ferroelectrics, optical materials, catalysts, pigments, and biological and medical devices. Study of nanotechnology and its relation with the environment.

INGE 5085. MATERIAL SCIENCE AND ENGINEERING SEMINAR. One credit hour. One hour of lecture per week. Prerequisites: INGE 4001 or INGE 3045 or INME 4107 or authorization of the Director of the Department.

Oral and written presentations about materials science and engineering topics.

INGE 5095. BIOMECHANICS OF THE MUSCULOSKELETAL SYSTEM. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3032 or INGE 3035 or authorization of the Director of the Department.

Study of the mechanisms of human musculoskeletal system. Analysis of the highly complex and intricate movements of various joints in the body. Study of the mechanical properties of bones, cartilages, tendons, ligaments and muscles

that comprise a joint. Analysis techniques of static and dynamic equilibrium that explain the musculoskeletal interactions which causes joint movement.

INGE 5104. NANOMEDICINE FUNDAMENTALS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4001 or INGE 3045 or INME 4107 or authorization of the Director of the Department.

Overview of the distinctive features of nanotechnology and their application to biomedical problems. Contrasts among macro/micro/nano to bring out the unique properties of nanotechnology in medicine. Introduction to cutting-edge of nanomedical technologies for sensing and imaging, drug delivery, and therapeutic applications will be addressed.

INGE 5185. INTRODUCTION TO COASTAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4015 or authorization of the Director of the Department.

Analysis of waves, including linear wave theory, wave transformation, wave statistics, and wave-induced flows. Analysis of the dynamics of tides, currents, and sea level variations and extreme events, the effects of coastal processes on cross-shore and alongshore sediment transport, on coastal morphology, and on the different types of coastal engineering stabilization measures. Design of beach nourishment and inlet stabilization. Discussion of the fundamental design considerations for coastal engineering structures.

INGE 5996. SPECIAL TOPICS. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Study of selected topics in general engineering. The selection and scope of the topics shall be in accordance with the interests and needs of the students.

DEPARTMENT OF INDUSTRIAL ENGINEERING

ININ 3100. INTRODUCTION TO INDUSTRIAL ENGINEERING. One credit hour. One hour of lecture per week.

Introduction to the industrial engineering profession. Discussion of the function of industrial engineers, the technical areas that they should master, examples of typical problems they solve, and their professional opportunities and perspectives. Introduction to the code of engineering ethics and relevant professional societies.

ININ 4007. INDUSTRIAL ORGANIZATION AND MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3063 and ECON 3021.

Principles of design and control; decision models in engineering and industrial systems.

ININ 4009. WORK MEASUREMENT. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisites: ININ 4077 and ININ 4020.

Theory and practice of work measurement systems; time studies using direct observations; predetermined time systems and work sampling; formula construction, line balancing, and learning curves.

ININ 4010. PROBABILITY AND STATISTICS FOR ENGINEERS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: MATE 3032 and (CIIC 3015 or CIIC 3011 or INGE 3016).

Descriptive statistics. Probability theory. Discrete and continuous random variables and distributions and their applications in engineering. Sample statistics and their distributions. Applications to engineering problems.

Hypothesis testing and confidence intervals. Emphasis on the use of statistical computer packages and their use in engineering.

ININ 4015. ENGINEERING ECONOMIC ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3032.

Criteria and techniques of economic analysis as related to decision making in engineering projects where time and money are the primary trade-offs. Discounted cash flows; comparison of alternatives using equivalent annual cost, present worth, or rate of return; break-even analysis, depreciation, tax effects, replacement, sensitivity, and risk analysis.

ININ 4016. INDUSTRIAL SAFETY. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077.

The fundamental of safety engineering, accident analysis and prevention, and accident cost determination; analysis of the accident problem in Puerto Rico. Emphasis is placed on the development of a philosophy of safety.

ININ 4017. COMPUTER-BASED INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3016 or CIIC 3011 or CIIC 3015 or COMP 3010.

Analysis and design of computer-based information systems; database logical and physical models; database languages; user interface; internet; common applications to industrial engineering.

ININ 4018. DISCRETE-EVENT SYSTEM SIMULATION. Three credit hours. Three hours of lecture per week. Prerequisites: (ININ 4022 or ININ 4150) and ININ 4020.

Modeling the interrelationship between component of systems by means of computer programs; generation of random variables using computers; use of special purpose simulation languages. Input and output analysis. Emphasis on problem-solving using modern simulation packages.

ININ 4020. APPLIED INDUSTRIAL STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4010 and MATE 3063.

Application of advanced statistical concepts in engineering. Joint probability functions, goodness of fit test, regression analysis, multicolinearity, design and analysis of industrial experiments. Emphasis on the use of statistical computer packages and their use in engineering.

ININ 4021. DETERMINISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4010 and (MATE 4145 or MATE 4031).

Formulation and solution of linear programming problems: the Simplex method, duality and sensitivity analysis; transportation problems; Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT); integer programming problems: branch and bound; linearization of non-linear objective functions; shortest route and maximum flow algorithms.

ININ 4022. PROBABILISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4020.

Simulation techniques; queuing theory; application to industrial systems problems.

ININ 4027. DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4020.

Fundamental principles in the design and analysis of engineering experiments: randomized blocks, latin squares, split plots, factorial experiments, fractional factorials; confounding and response surface methodology.

ININ 4029. HUMAN BEHAVIOR IN WORK ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077.

Cognitive theories and behavioral principles which attempt to explain, predict, and control individual and group behavior in work organizations.

ININ 4039. PRODUCTION PLANNING AND CONTROL I. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4020 and ININ 4021. Corequisite: ININ 4015.

Analysis and design of production-inventory systems: Forecasting (Multiple regression and time series analysis), aggregate production planning, master production schedule, inventory systems and their models, project control. Computer applications in these areas.

ININ 4040. FACILITIES LAYOUT AND DESIGN. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: (ININ 4009 or ININ 4072) and ININ 4155 and INGE 3011 and (ININ 4021 or ININ 4150). Corequisite: ININ 4015.

Planning facilities layout and materials handling systems, analytical and computerized solution of problems in the design of physical facilities.

ININ 4046. INDUSTRIAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: authorization of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in industrial engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

ININ 4050. PRINTED CIRCUIT BOARD ASSEMBLY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3132 and QUIM 3134) and (FISI 3172 and FISI 3174) or authorization of the Director of the Department.

Interdisciplinary experience to provide engineering students with a basic understanding of the manufacturing processes required to populate a printed circuit board focusing on surface mount technology. Lectures will include a discussion of processes, required tooling, the process, underlying scientific principles, use of mathematical models, and independent process variables which impact product quality.

ININ 4057. AUTOMATION AND PROCESS CONTROL. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: (INEL 4078 or INEL 4076) and (CIIC 3011 or CIIC 3015 or INGE 3016 or COMP 3010).

Use of computer-based controllers to control processes using digital and analog signals.

ININ 4071. ERGONOMICS AND HUMAN FACTORS IN WORK SYSTEMS DESIGN. Three credit hours. Two hours of lecture per week, two hours of laboratory every two weeks and two hours of workshop or practice every two weeks. Prerequisite: ININ 4010.

An introduction to ergonomics and the significance of human factors in work systems design. Application of tools and techniques to perform ergonomic assessment for the identification of occupational risk factors and proposal of alternative designs to address them.

ININ 4072. METHODS AND WORK MEASUREMENT. Three credit hours. Two hours of lecture per week, two hours of laboratory every two weeks and two hours of workshop or practice every two weeks. Prerequisite: ININ 4071.

Application of strategies and models used in work systems design in combination with work measurement strategies to evaluate and improve system productivity and efficiency.

ININ 4075. PRODUCTION PLANNING AND CONTROL II. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4039.

Evaluation and design of computerized systems for planning and controlling production. Material requirements planning, bill of materials, inventory accuracy and cycle counting, feasible master production plan, capacity planning, shop floor control, integrity requirements of the data bases, systems implementation. Formation of product families, group technology, just in time, kanban system, production synchronization, integration of production control systems.

ININ 4077. WORK SYSTEMS DESIGN. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: ININ 4010.

Strategies and models used in work systems design including methods engineering, human factors, and ergonomics.

ININ 4078. STATISTICAL QUALITY CONTROL. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: ININ 4020.

Statistical control of the quality of processes; statistical methods for quality improvement; univariate and multivariate control charts for variables; attribute control charts; process capability studies; gage and measurement studies; setting specification limits; analysis and design of sampling inspection plans; mil. Std. 105e, rectifying inspection plans.

ININ 4079. DESIGN PROJECT. Three credit hours. Three hours of laboratory per week. Prerequisites: (ININ 4015 and ININ 4040 and (ININ 4999 and authorization of the Director of the Department)).

Development and presentation of a system design project.

ININ 4085. ACCOUNTING FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Basic accounting concepts and systems; uses and limitation of accounting data in the solution of managerial and financial problems; interpretation and use of accounting information for decision making.

ININ 4086. COST ANALYSIS AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4085.

Methods used in industry for budgeting, recording, analyzing, and controlling costs; profit planning; design and operation of cost systems; standard cost; and financial statement analysis.

ININ 4087. COST MANAGEMENT. Four credit hours. Four hours of lecture per week. Prerequisite: ININ 4010.

Study of techniques to estimate, manage, and control costs in engineering projects, in service and manufacturing organizations. Discussion of case studies and use of computer applications to solve problems.

ININ 4090. INTERDISCIPLINARY APPROACHES TO PROJECT MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4085.

Study and application of the fundamental techniques of project management. Participation in the management of an actual public or private project using and interdisciplinary approach. Field work required.

ININ 4150. INTRODUCTION TO MODELS IN OPERATIONS RESEARCH. Four credit hours. Four hours of lecture per week. Prerequisite: ININ 4010 and (MATE 4145 or MATE 4031).

Theoretical foundation and algorithms to formulate and solve linear programing and basic queuing problems. Formulation of real life problems, and introduction of optimization methods for their solution. Development of computational skills through the use of software to solve solving the formulated problems.

ININ 4155. DESIGN AND ANALYSIS OF PRODUCTION SYSTEMS AND INVENTORY MANAGEMENT. Four credit hours. Four hours of lecture per week. Prerequisite: ININ 4020. Corequisites: ININ 4015 and (ININ 4150 or ININ 4021).

Study of analytical tools for the design and improvement of production and inventory systems. Discussion of topics such as forecasting techniques, aggregate production planning, inventory models, master production scheduling, material requirements planning, capacity planning, and shop floor control systems, among others.

ININ 4201. INTRODUCTION TO MATHEMATICAL MODELS FOR INDUSTRIAL ENGINEERING APPLICATIONS. Two credit hours. One hour of lecture and two hours of computational section per week. Prerequisites: MATE 3032 and (INGE 3016 or CIIC 3011 or CIIC 3015 or COMP 3010).

Introduction to techniques for solving linear models and identifying their applications in Industrial Engineering. Use and application of matrix operations in the context of Industrial Engineering problems. Description of linear independence and bases; solving system of linear equations.

ININ 4435. METHODS AND WORK MEASUREMENT. Five credit hours. Four hours of lecture and two hours of laboratory per week. Prerequisite: ININ 4010.

Application of strategies and models used in work systems design including Methods Engineering and Lean Thinking. Theory and practice of work measurement systems; using direct time studies; predetermined motion time systems and work sampling; worker efficiency, line balancing, and learning curves.

ININ 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Three to nine credit hours. Prerequisites: Have approved at least 48 credits and have received orientation about the Coop plan. Be registered in the Industrial Engineering program.

Practical experience in industrial engineering in cooperation with private industry or government to be jointly supervised by the academic department, the co-op program coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

ININ 4996. SPECIAL PROBLEMS. One to three credit hours. One to three laboratory periods per week. Prerequisite: authorization of the Director of the Department.

Investigations and special problems in Industrial Engineering or related fields. Open only to outstanding students in the field of Industrial Engineering.

ININ 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

ININ 4999. CAPSTONE DESIGN PROJECT SEMINAR. One credit hour. One hour of seminar per week. Corequisite: ININ 4040.

Definition of engineering design problems and identification of relevant industrial engineering theoretical modules in preparation for its solution.

Advanced Undergraduate and Graduate Courses

ININ 5005. MODERN OPTIMIZATION METHODS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4021 or ININ 4150 or authorization of the Director of the Department.

Advanced undergraduate course addressed to industrial engineering students to studies the most common heuristic search methods. Topics such as simulated annealing, genetic algorithms, tabu search, and combinatorial and continuous optimization problems are discussed. The main techniques and their variations presented and are critically discussed. Key papers from the literature, including applications, are discussed.

ININ 5006. SYSTEMS ENGINEERING AND ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4015 or ININ 4007 or INCI 4055 or INCI 4026 or authorization of the Director of the Department.

Introduction to the design of systems considering their lifecycle from conceptualization until disposal, including the basic theory of systems lifecycle management. Study of techniques to evaluate the design of systems that could be industrial, mechanical, electronic, or organizational, with application to multiple disciplines.

ININ 5007. COMPLEX SYSTEMS MODELING AND SYSTEM DYNAMICS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: ININ 4021 or ININ 4150 or authorization of the Director of the Department.

Introduction to modeling of system dynamics for the analysis of business decisions with a focus on industrial, service and public policy applications, particularly those decisions forced by structural changes , policies and strategies that affect how the system behaves. Includes the conceptual tools to understand the structure and dynamics of complex systems.

ININ 5009. LEAN SIX SIGMA METHODOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (ININ 4078 and (ININ 4039 or ININ 4155)) or authorization of the Director of the Department.

Discussion of the basic principles of lean and six sigma methodologies to maximize the value of a product or service focusing primarily on customer satisfaction. Use of the DMAIC methodology as a structured way to integrate the tools of industrial engineering to solve problems related to processes and systems improvement.

ININ 5025. QUEUEING SYSTEMS AND SIMULATION. Four credit hours. Four hours of lecture per week. Prerequisites: ININ 4020 and (ININ 4021 or ININ 4150).

Analysis of stochastic systems using the theoretical foundation of basic queuing networks and discrete-event simulation. Modeling of the interrelationship between system's components through the generation of random variables, input/output analysis, and experimental design and optimization. Emphasis on modeling industrial systems using computer simulation packages.

ININ 5105. INTRODUCTION TO MEDICAL DEVICE DESIGN METHODS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4020 or INME 4055 or INEL 4205 or INQU 4008 or authorization of the Director of the Department.

Discussion of fundamental methods for medical device development. Study of the process of medical device development, from concept to marketing. Analysis of procedures of product definition, design, risk management, production planning and market introduction, FDA (Food and Drug Administration) regulations, and intellectual property protection. Case studies illustrating important considerations to manage the complexities of the development process are included.

ININ 5200. INTRODUCTION TO ENGINEERING MANAGEMENT. Three credit hours. One and a half hour of lecture and one and a half hour of discussion per week. Prerequisites: ININ 4015 or ININ 4007.

Study and application of the fundamentals of management concepts to multidisciplinary engineering teams.

ININ 5405. STATISTICAL METHODS IN BIOINFORMATICS. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4010 or ININ 5559 or INCI 4136 or AGRO 5005 or ESMA 3101 or ESMA 4001 or ESMA 4006 or ESTA 3002 or authorization of the Director of the Department.

Study and application of statistical methods related to bioinformatics analysis including sequence analysis, gene expression and phylogenetic trees. Use of methods such as inferential statistics, statistical modeling, clustering analysis and Markovian processes.

ININ 5505. TOTAL QUALITY MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4078 or authorization of the Director of the Department.

Introduction to innovative philosophies in total quality control. The impact of leadership, organizational infrastructure and client satisfaction on quality management. Utilization and management of information, personnel, processes and product design for continuous quality improvement.

ININ 5555. INTRODUCTION TO NONLINEAR OPTIMIZATION AND NEURAL NETWORKS. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 and (INGE 3016 or CIIC 3011 or CIIC 3015 or COMP 3010)) or authorization of the Director of the Department.

Optimization techniques in the context of problems with or without restrictions in industrial engineering. Multivariate search methods with or without derivatives. Description of artificial neural networks as a nonlinear optimization technique. Analysis and design of artificial neural networks, using supervised and unsupervised algorithms. Applications of nonlinear optimization and neural networks in the field of industrial engineering.

ININ 5559. ENGINEERING STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3032 and INGE 3016) or authorization of the Director of the Department.

Development of probability theory for scientific and engineering inference. Discrete and continuous random variables and distributions and their applications in engineering. Hypothesis testing and confidence intervals. Regression analysis. Applications to engineering problem solving.

ININ 5565. MEASUREMENT AND PREDICTION OF PRODUCT RELIABILITY. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4020 or authorization of the Department.

Introduction to reliability theory; system analysis; constant failure rate models; time dependent failure rate models; state dependent systems; availability; maintainability; complete and censored data analysis (parameter estimation and distribution fitting); prediction of reliability.

ININ 5575. SEQUENCING AND SCHEDULING OF RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4021 or ININ 4150 or authorization of the Director of the Department.

Conceptual and practical aspects involved in the scheduling of resources. Examples and applications drawn from areas such manpower, computer, and transportation.

ININ 5595. DESIGN AND MANAGEMENT OF SERVICES PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4009 and (ININ 4039 or ININ 4155 or authorization of the Director of the Department).

Industrial engineering techniques and models to design and manage the operations of service organizations or services processes in manufacturing enterprises. Development, evaluation, and implementation of alternative solutions to the operational problems of service organizations. Use of models and techniques in marketing, quality assurance and management, work measurement and design, operations research, production planning and control, engineering economics, human resources, management information systems, and facilities layout.

ININ 5997. SELECTED TOPICS IN INDUSTRIAL ENGINEERING. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Discussion of selected topics in Industrial Engineering or related fields.

DEPARTMENT OF MECHANICAL ENGINEERING

INGE/INME 3809. CREATIVE DESIGN I. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Introduction to the underlying principles and methodologies of engineering graphics communications, as a tool for the solution of engineering problems: Fundamentals of graphic visualization, sketching, PC-based Computer-Aided-Design (CAD), and technical presentations. An introduction to computer-aided-design software will include principles of parametric solid modes of mechanical parts and assemblies including dimensions and tolerances. Solid modeling is the tool for visualization, and analysis of engineering problems.

INME 3810. CREATIVE DESIGN II. Two credit hours. One hour of lecture and two hours of workshop per week. Prerequisites: INGE 3011 or INGE 3809 or INME 3809.

Product dissection uses hands-on dissection exercises to develop in students the ability to understand a machine in not only its functionality but also in terms of its history, social impact, the design methodology, the marketing constraints and the customer needs. Use of proper technical vocabulary to describe mechanical and electrical components. Learn oral, written, and hand sketching communication skills.

INME 4001. THERMODYNAMICS I. Three credit hours. Three hours of lecture and one hour of tutorage per week. Prerequisites: (QUIM 3001 or QUIM 3041 or (QUIM 3131 and QUIM 3133)) and (FISI 3174 or FISI 3164) and (FISI 3172 or FISI 3162).

A study of the fundamental laws of thermodynamics as applied to closed and open systems. Properties, equations of state, processes and basic cycles.

INME 4002. THERMODYNAMICS II. Three credit hours. Three hours of lecture and one hour of tutorage per week. Prerequisite: INME 4001.

The application of the fundamental concepts of thermodynamics to the study of power and refrigeration cycles and combustion processes. Introduction to gas dynamic: concepts, nonreactive mixtures and psychrometrics.

INME 4003. DESIGN OF THERMAL AND FLUID SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4001 and INME 4015.

Analysis and design of piping systems and heat exchangers. Selection of pumps and fans. Systems simulation and modeling.

INME 4005. MECHANISM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3032 and INGE 3016.

Concepts of kinematic analysis of basic mechanics, such as linkages, cams, and gears.

INME 4006. DYNAMICS OF MACHINERY. Three credit hours. Two hours of lecture and one two-hour computation or demonstration period per week. Prerequisites: MATE 4009 and INME 4005.

A study of static and inertia forces in machinery; free and forced vibration isolation; balancing of rotors; critical speed of shafts.

INME 4009. AUTOMATIC CONTROLS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: MATE 4009 and INGE 3032 and INEL 4075 and (INEL 3105 or INEL 4005).

Use, calibration and sensitivity of instruments for measuring temperature, pressure, volume, strain, and fluid flow: analysis of electrical, electronic, hydraulic, mechanical and pneumatical servomechanisms; control systems and their characteristics, such as: response, sensitivity and stability.

INME 4011. DESIGN OF MACHINE ELEMENTS I. Three credit hours. Three hours of lecture per week. Prerequisites: (INME 4107 or INME 4108 or INGE 4001) and (INGE 4019 or INGE 4012).

Application of strength of materials and materials science in machine element design. Introduction and use of static and dynamic failure theories in the design of machine elements.

INME 4012. DESIGN OF MACHINE ELEMENTS II. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4011.

Analysis and design of specific machine components including screws, nuts, springs, gears, bearings, shafts, brakes, clutches, and couplings.

INME 4015. HEAT TRANSFER. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009 and INGE 3016 and (INME 4001 or INME 4045) and (INGE 4015 or INGE 4010).

Fundamentals of steady and unsteady conduction, forced and natural convention and radiation. Introduction to heat exchangers.

INME 4018. ENERGY CONVERSION. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4015, INEL 4076 and INME 4002.

A study of the different methods of energy conversion. The course will cover the basic theoretical concepts, and will include discussions on conventional and modern devices for energy conversion, such as steam generators, internal combustion engines, turbines, thermoionic and thermoelectric systems, fuel cells, thermonuclear plants, and lasers.

INME 4019. ENERGY AUDITING AND MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4001 or INQU 4011.

Fundamental concepts of energy engineering; principles and methods related to the use, conservation, auditing and management of energy sources.

INME 4027. POWER PLANT ENGINEERING. Three credit hours. Two hours of lecture and three of computation per week. Prerequisites: INME 4002 and INME 4015.

The application of fundamental concepts of thermal sciences and economics to the analysis of power generating stations; emphasis on steam and gas systems.

INME 4031. MACHINE SCIENCE LABORATORY. Two credit hours. One two-hour laboratory per week. Prerequisites: INME 4015, INEL 4076 and INME 4002.

Experiments and projects in the areas of machine science: synthesis and analysis of kinematics chains, shafts, gears, torque loading in bolt assemblies, dynamic and static loading, fatigue and other failure mechanisms. Introduction to applied statistics and design of experiments, use of transducers, sensors and computer-based data acquisition systems for collecting and evaluating data related to position, velocity, acceleration, force, torque, mechanical vibrations, and sound level.

INME 4035. REFRIGERATION AND AIR CONDITIONING. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4015 and INME 4002.

A comprehensive study of the fundamentals of air conditioning; psychometric calculations; comfort, health and industrial processes requirements; heating and cooling loads; air conditioning equipment and its selection.

INME 4037. INTERNAL COMBUSTION ENGINES. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4015.

A presentation and study of modern spark-ignition and compression-ignition engines, including types and characteristics; operating power cycles; combustion phenomena; engine performance; heat losses and efficiencies.

INME 4039. MECHANICAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the summer or its equivalent during the semester. Prerequisite: authorization of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in mechanical engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INME 4045. GENERAL THERMODYNAMICS FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 3172 or FISI 3162 or FISI 3012) and (QUIM 3002 or QUIM 3042 or (QUIM 3132 and QUIM 3134)).

Fundamental laws and principles of thermodynamics and their application in engineering. Thermodynamic and energetic concepts, properties of pure substances, heat transfer, heat engines.

INGE/INME 4046. FUNDAMENTALS OF VIBRATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3032. Co-requisite: MATE 4009.

Study of the theory of vibration for single- and two-degree-of freedom systems. Free vibration analysis, response to harmonic and non-harmonic excitations, design for vibration control, and introduction to matrix analysis of multi-degree-of-freedom systems.

INME 4055. MANUFACTURING PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4001 or INME 4107 or INME 4108.

Different manufacturing processes and machine-tools; influence of the method of fabrication upon the properties of materials; computer and numerical control of machine-tools; use of plastics.

INME 4056. MANUFACTURING PROCESSES LABORATORY. One credit hour. Three hours of laboratory per week. Prerequisite: (INME 3809 o INGE 3809 o INGE 3011). Corequisite: INME 4055.

Study and application of design; problem formulation; conceptual design, evaluation and prototype development; study of common manufacturing processes. Demonstrations and operation of machine-tools in modern manufacturing.

INME 4057. ENGINEERING DESIGN. Four credit hours. Two hours of seminar and six hours of practice per week. Prerequisites: INME 4002 and INME 4012 and INME 4015.

Formulation, design and analysis of engineering projects; creative aspects of design, design methodology, safety, liability and patents. Technical presentation, both oral and written.

INME 4058. COMPUTER AIDED DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4012 and INME 4015.

Study of the principles of computer aided engineering design applied to mechanical engineering problems. Introduction to finite element and design optimization techniques. Use of programming and commercial software to design mechanical system.

INME 4065. PRODUCT DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: authorization of the Director of the Department.

Factors affecting a product design: composition, cost, reliability, quality, maintainability, manufacturability, and aesthetics. These factors are applied in a project design.

INME 4107. MATERIALS SCIENCE AND ENGINEERING Four credit hours. Three hours of lecture and two hours of laboratory per week. Prerequisites: QUIM 3132 and QUIM 3134 and FISI 3171.

A study of the relationship of the mechanical properties of materials to their micro and macro structure, with emphasis on the application of materials in the fields on engineering.

INME 4108. MATERIALS SCIENCE AND ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3131 and QUIM 3133 and FISI 3171.

Study of the relationship of the mechanical properties of materials at the micro and macro structure levels emphasizing the application of materials in the fields of engineering.

INME 4109. MATERIALS SCIENCE AND ENGINEERING LABORATORY. One credit hour. Two hours of laboratory per week. Prerequisite: INME 4108.

Students will conduct experiments to identify materials based on their properties, including crystal structures, microstructures, defects, fractures, phase transformations, heat treatments, and mechanical behavior of materials.

INME 4157. ENGINEERING DESIGN. Four credit hours. Two hours of seminar and six hours of practice per week. Prerequisites: INME 4056 and INME 4012 and INME 4003 and INME 4220 and ININ 4015. Corequisite: INME 4238.

Formulation, design and analysis of engineering projects; creative aspects of design, design methodology, safety, liability and patents. Technical presentation, both oral and written.

INME 4210. SYSTEM DYNAMICS AND CONTROLS I. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009 and (INEL 4075 or INEL 3105) and INGE 3016 and INME 4005 and INME 4001.

Modeling, simulation and analysis of dynamic systems with and without basic control actions in mechanical engineering within time, complex and frequency domains. Application of vector and analytical mechanics; Kirchhoff current and voltage laws; conservation of mass and energy; and constitutive relations to determine governing equation(s). Use of analytical, numerical and applicable software solution techniques applied to single and coupled differential equations**.**

INME 4220. SYSTEM DYNAMICS AND CONTROLS II. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisite: INME 4210.

Analysis and design of dynamic systems with and without basic control actions found in mechanical engineering. Use of complex methods and frequency methods along with an introduction to state-space modeling. The laboratory for the course will use a standardized industrial software for analysis and design.

INME 4235. MECHATRONICS LABORATORY. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisites: INME 4210 and INME 4011 and INME 4002 and INEL 4076. Co-requisito: INME 4015 and INME 4012.

Experiments and exercises in instrumentation, calibration, statistical methods, data acquisition, and computer interfacing to design, and monitor systems with the use of control theory, electronics and computing.

INME 4236. THERMAL SCIENCE LABORATORY. Two credit hours. One hour of lecture and three hours of laboratory per week. Prerequisite: INME 4235.

Experiments and projects in the thermal sciences discipline including the areas of thermodynamics, heat transfer and fluid mechanics. Transducers, sensors and data acquisition systems are used to measure temperature, flow rate, pressure, voltage and electrical current in various systems and applications.

INME 4237. MECHATRONICS LABORATORY. Two credit hours. One hour of lecture and three hours of laboratory per week. Prerequisites: INME 4210 and (INEL 4201 or INEL 4076) and ININ 4010.

Experiments and exercises in the synergistic combination of sensors and actuators commonly used in the design of mechatronic systems. Use of micro-controllers and Programmable Logic Controllers for the control of sensors and actuators. Implementation of: a) control logic for autonomous systems; b) Hardware of actuators such as DC motors, stepper motors and servo motors; c) Hardware of analog and digital sensors; d) Hardware of common electrical circuits such as voltage dividers, Wheatstone bridge and H-bridge.

INME 4238. THERMAL SCIENCE LABORATORY. Two credit hours. One hour of lecture and three hours of laboratory per week. Prerequisites: INME 4237 and INME 4002. Corequisite: INME 4003.

Experiments and projects in the thermal sciences discipline including the areas of thermodynamics, heat transfer and fluid mechanics. Transducers, sensors and data acquisition systems are used to measure temperature, flow rate, pressure, voltage and electrical current in various systems and applications.

INME 4705. APPLIED AERODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3016 and (INGE 4010 or (INGE 4015 and INGE 4016)) and (MATE 4009 or MATE 4145).

Analysis of fluid flow behavior around a rigid body by applying the continuity, momentum and energy equations, two-dimensional potential flow, and the panel method. Analysis of finite wings models using two- and three-dimensional lifting theory and vortex lattice solutions. Study of compressibility effects to analyze fluid flow behavior around transonic wings. Introduction to computational fluid dynamics.

INME 4707. GAS TURBINE THERMODYNAMICS AND PROPULSION. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4002 or INQU 4012 or INME 4045 and INGE 4010 and (INGE 4015 and INGE 4016) and INGE 3016 and MATE 4009 or MATE 4145. Corequisite: INME 4002.

Study of how concepts of thermodynamics, fluid mechanics, aerodynamics, and compressible flow theory are applied to the analysis and design of aircraft jet engines. Analysis of gas turbine using jet engine familiarization, cycle analysis, propulsion and turbomachinery theories. Study of jet engine performance using energy budgets and its optimization in the jet engine cycle. Discussion of actual industry testing applications.

INME 4709. AIRCRAFT PERFORMANCE. Three credit hours. Three hours of lecture per week. Prerequisites: (INGE 3032 or INGE 3035) and (MATE 4009 or MATE 4145) and INGE 3016.

Study of performance and design characteristics of conventional aircraft using atmospheric properties, and the concepts of lift and drag. Design for specified flight conditions and the flight conditions for best performance using the physical characteristics of an aircraft. Analysis of level flight performance, rates of climb, service and absolute ceilings, range, take-off and landing, and turn performance.

INME 4717. INTRODUCTION TO AIRCRAFT STRUCTURAL ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3016 and (INGE 3035 or INGE 3032) and (MATE 4009 or MATE 4145).

Introduction and application of solid mechanics to analyze aerospace structures. Study of aircraft components and their design philosophy. Environmental load design diagrams. Development and application of elasticity to describe the stress, strain, and displacement fields of one- and two-dimensional problems in aerospace structures. Analysis of bending, shear and torsional theories for arbitrary, multimaterial, and multicell wing cross-sections. Analysis of thin-walled single and multicell stiffened shell sections using analytical and numerical solutions.

INME 4810. DESIGN AND TECHNIQUES FOR AUTOMATION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: INME 4055.

Introduction to automatic assembly systems. Design of products for ease of assembly. Analysis and design of special purpose automated equipment for parts manufacture, assembly, packaging or general industrial automation. Design of automatic assembly systems and their integration using programmable logic controller technology.

INME 4850. INTRODUCTION TO ROBOTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4011.

Analysis and design of mechanical manipulators by means of kinematic and dynamic models. Use of the direct or inverse kinematics analysis techniques to calculate the position of the robot tool, the required joint variables, and to perform workspace analysis and trajectory and motion planning.

INME 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to nine credit hours. Prerequisite: authorization of the Director of the Department.

Practical experience in mechanical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the co-op program coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INME 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of research per week. Pre-requisite: fourth or fifth year student and authorization of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

Advanced Undergraduate Courses

INME 5005. LUBRICATION. Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Fundamental principles and concepts of lubrication theory; hydrostatic and hydrodynamic lubrication; examples of journal and thrust bearing design, using both the hydrostatic and hydrodynamic principles; considerations in boundary lubrication.

INME 5007. SOLAR ENERGY APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4015 or INQU 4001 or authorization of the Director of the Department.

Fundamentals of solar radiation, its measurement, and methods of estimation. Selected topics on heat transfer relevant to systems design applications of solar energy such as flat plate and focusing collectors, energy storage systems, heating and cooling systems, power systems, and distillation processes.

INME 5008. CORROSION. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4007 or INME 4107 or authorization of the Director of the Department.

Electrochemical principles and corrosion mechanisms; protection and prevention of corrosion in metals; the effects of temperature, environment, and metallurgical factors.

INME 5010. DESIGN THINKING. Three credit hours. Three hours of lecture per week. Prerequisite: 30 credits approved or more in their discipline.

A study of the design thinking methodology in the context of a project-based course. Investigation of user needs, problem identification, creation of possible solutions, analysis and selection of solutions. Creation of a functional prototype demonstrating the usability and viability of the product.

INME 5015. SELECTED TOPICS IN MECHANICAL ENGINEERING. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

A study of certain selected topics in mechanical engineering not covered by other existing courses.

INME 5018. MATERIALS FAILURE ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: ((INME 4012 and INME 4007) or (INME 4012 and INME 4107)) or authorization of the Director of the Department.

Materials science concepts used to identify, correct and prevent failure due to the improper use of materials or to problems in manufacturing processes. In depth study of failure mechanisms such as fatigue, wear, creep, and corrosion.

INME 5025. METALS FATIGUE. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4007 or INME 4107 or authorization of the Director of the Department.

Nature of metal fatigue; modern approaches to design of mechanical components for repeated loadings; importance of residual stresses and stress concentrations; analysis of cumulative damage and life prediction; cycle counting and sequence of events.

INME 5510. INTRODUCTION TO FINITE ELEMENT MODELING. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: (INME 4011 and INGE 3016) or authorization of the Director of the Department.

Study of the foundations, methods and techniques used in Finite Element Modeling (FEM). Use of FEM codes to analyze solids in problems of practical engineering interest. Emphasis on the use of FEM as a tool and means to obtain engineering solutions.

INME 5520. INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS. Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: INME 4015 or authorization of the Director of the Department.

Study of the foundations, methods and techniques used in computational fluid dynamics (CFD). Use of CFD codes to analyze solids in problems of practical engineering interest. Emphasis on the use of CFD as a tool and means to obtain engineering solutions.

INME 5530. INTRODUCTION TO MULTIBODY DYNAMICS MODELING (MBD). Three credit hours. Two hours of lecture and two hours of laboratory per week. Prerequisites: INME 4005 or authorization of the Director of the Department.

Study of the foundations, methods and techniques used in Multibody Dynamics (MBD). Use of MBD codes, solid modeling, and dynamic methods for kinematic-kinetic analysis and design of rigid and flexible multi-body assemblies in two and three dimensions with applications to machinery.

INME 5707. GAS TURBINE SYSTEM OPERATION. Three credit hours. Three hours of lecture per week. Prerequisites: ((INME 4002 or INME 4045 or INQU 4012) and INGE 3016 and INME 4707) or authorization of the Director of the Department.

Study of jet engine performance using energy budgets and its optimization in the jet engine cycle. Study of turbomachine components, such as compressors, combustors, turbines and nozzles, as integrated into a system that produces power aircrafts. Development of a thermodynamic model for a turbofan engine to investigate design and off-design behavior, and the response to external and internal parameters. Study the influence of design criteria such as structural integrity, emissions, acoustics, and operationally-stable throttle response on the integration process.

INME 5717. AIRCRAFT STRUCTURAL ANALYSIS AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: (INME 4717 and (INGE 4019 or INGE 4012)) or authorization of the Director of the Department.

Application of work and energy principles, and numerical methods, to the design of flight vehicles. Study of deflection and load analysis using the principle of virtual work, principle of contemporary virtual work, analytical weak form solutions, and the finite element formulation. Wing design considering: fatigue, aeroelasticity, divergence, environmental loads, aerospace materials, dynamic stability of thin-walled compression members, and structural dynamics.

INME 5995. SPECIAL PROBLEMS. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Researches and special problems in Mechanical Engineering and related fields.

INME 5996. SPECIAL PROBLEMS II. One to six credit hours. One hour of lecture per week per credit. Prerequisite: authorization of the Director of the Department.

Study of special problems in Mechanical Engineering and related fields.

INME 5997. SELECTED TOPICS II. One to six credit hours. One to six hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Study of selected topics in mechanical engineering or related fields.