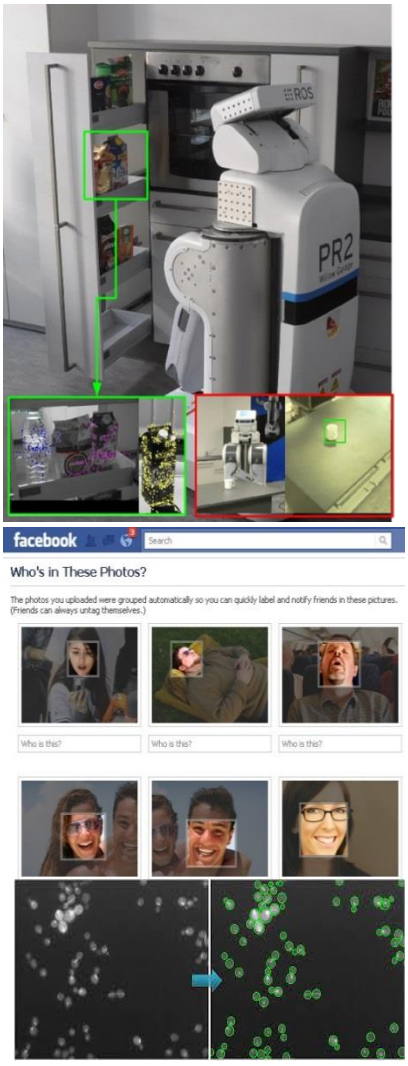
Optional Courses in Science and Engineering 2014-2

PUCP

Introduction to Computer Vision and Machine Learning



Machine Learning covers a wide variety of information processing methods to make computers learn from experience. On the other hand, Computer Vision covers methodologies to acquire and transform images to extract meaningful information. Nowadays, Machine Learning and Computer Vision have become an essential foundation to solve real life problems relevant to all fields of science and engineering for applications that range from medical image processing to detect cancer cells, to vision-based obstacle detection for robotic systems.

The main objective of this course is to introduce the student to computer vision and machine learning algorithms, methods and concepts, along with programming techniques which will enable the student to implement systems for real applications. Lab exercises will provide hands-on experience through implementation of some popular approaches as well as familiarization with commonly used software libraries for application development.

Code: **ING341**

Evaluation: The course grade will be assigned based on programming assignments, a midterm and a final exam.

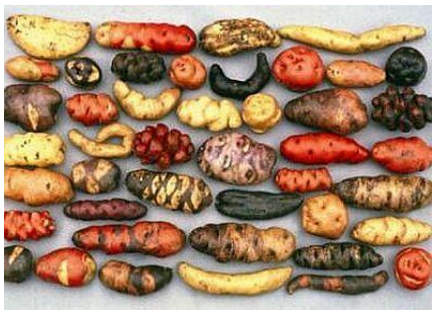
Instructor:

Christian I. Penaloza
Ph.D. Engineering Science
Osaka University - Japan

Integrative ecology of the central Andes

The central segment of western South America comprises Peru and the north of Chile and Bolivia. The region is home to dramatic altitudinal and climatic transitions which contribute to its unique biology, high biodiversity and the high degree of endemism among the species present.

The course will provide the basic concepts behind ecological theory and then proceed to review current research topics on ecosystem function, biodiversity and the human dimension in the region covering the transition from the Pacific Ocean over the Andes and into the Amazon rainforest.



A special emphasis will be placed on species interactions and their role in ecosystem services, the current and past anthropogenic influence on these ecosystems and potential biological effects of the human-mediated breakdown in the geographical barrier between east and west in central South America.

Code: ING309

Instructors:

Karin Bartl
PhD in Environmental Engineering
ETH Zurich - Suiza

Fabian Drenkhan
PhD in Geography
Universidad de Stuttgart – Alemania

Sustainable Energy

The search for sustainable energy sources, that keep providing humankind with energy-derived advantages without damaging the environment, affecting societal stability, or threatening the well-being of the future generations, will dominate the twenty-first century. This course provides an introductory overview of the current major sources of energy and related environmental and societal impacts, and takes an introductory look at where the world may find sustainable energy sources in the future cleaner use of fossil fuels or renewable energy sources.

This course will expose students to the principles of sustainability and sustainable energy: a living harmony between the equitable availability of energy services to all people and the preservation of the earth for future generations.

This course is designed to increase the student understanding of role of energy in modern society, the link between energy consumption, environmental degradation, social impacts and alternative energy approaches for the future.

Code: ING310

Evaluation: the final grade will include individual assignments, essays, reading quizzes, semester project, cooperative activities, field trips and one final exam.

Instructors:

Ramzy Kahhat
PhD in Civil and
Environmental Engineering
Arizona State University, Tempe, Arizona
USA

Bioscience and Biotechnology

During the course, you will learn:

Basic concepts in molecular biology and physical chemistry of macromolecules that allow understanding of the scientific concepts behind the transmission of genetic information, evolution and biological diversity that are applied to create technological advancement.

Applications to improve growing conditions, arable land and nutritional value will be discussed.

Specific applications of recombinant DNA technology in drug development, pharmacogenomics, diagnoses of genetic diseases, disease modeling and human gene therapy will be provided.

Concepts of innate and adaptive immunity will be explained as they apply in the development of biomaterials, biosensors, vaccines and regenerative medicine.

Competencies to face and explain complex ethical issues regarding the use of products, technologies and applications of biotechnology.

Basic principles regarding protection of intellectual property will be explained.

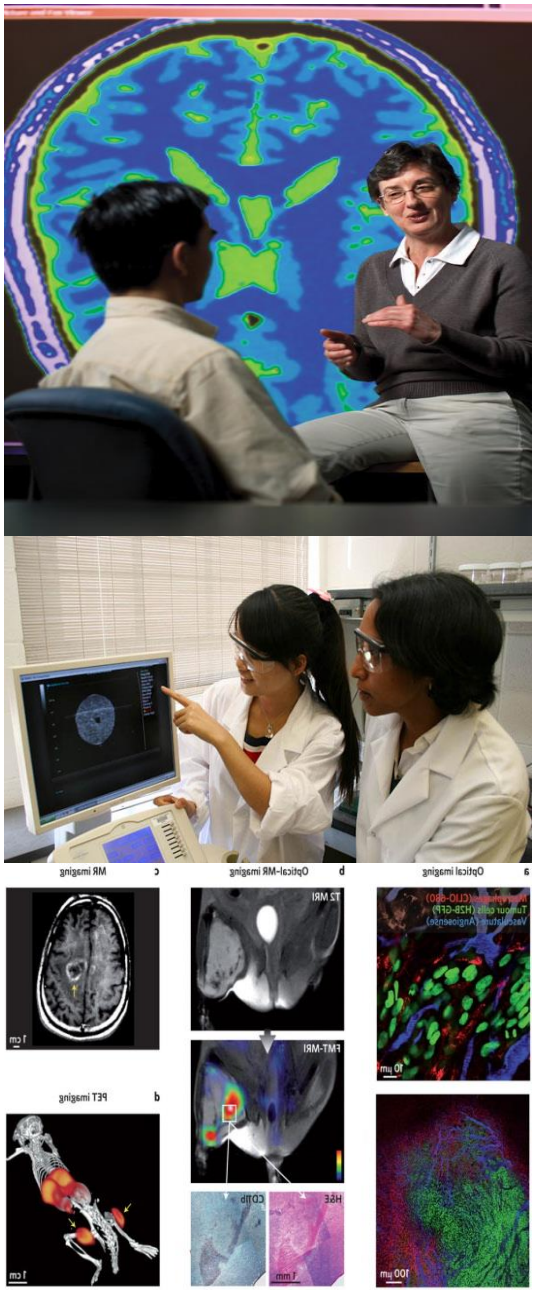
Code: **ING308**

Evaluation: The course will have two written evaluation, reports of field trips, and work group discussions in class.

Instructor:

Fanny Casado
PhD in Toxicology
University of Rochester - New York-USA

Introduction to Medical Imaging



This course introduces the students to the basic concepts regarding medical image formation and processing. The student will learn about the most important modalities to create radiological images and the physical principles behind them. In addition, topics about enhancing the images and extracting useful clinical information for detection and diagnosis will be covered.

The course provides an overview to understand the engineering components involved in Medical Imaging. These components could be further developed in specialized courses

Code: ING340

Instructor:

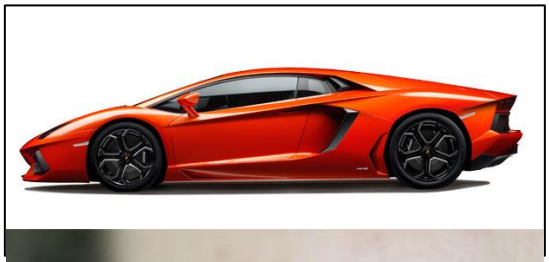
Benjamín Castañeda
Ph.D. in Electrical & Computer Engineering
Rochester Institute of Technology - USA

The Impact of Materials on Society

The development of materials has greatly impacted human history and societies. New technologies and products derived from innovation in materials science and engineering have changed the way we communicate, the clothes we use, the way we work, our transportation system, medical treatments, etc., dramatically improving the quality of our life.

This course is dedicated to present materials in a historical, technical, and interdisciplinary context, and to discuss their technological, economic, social, and environmental impacts. Particularly, materials and technologies devoted to face the society's current challenges: energy, health, security, infrastructure and environmental contamination, will be analyzed. In addition, the role of materials in novel industries such as nanotechnology and biotechnology will be reviewed.

Code: MEC36B



Evaluation: The course grade will be assigned based on the readings and a presentation of a case with a report submitted by the students at the end of the course. Case topics will be discussed and assigned in class and will be focused on materials or products that had generated a remarkable impact in society

Instructor:

Francisco Rumiche
PhD in Materials Engineering
University of Illinois, Chicago – USA

Introduction to Aeronautical Engineering

Advancement in the aerodynamics science support new application of aero technology. Aero technology can be defined as the application of scientific and engineering principles to improve current technology and develop aerial vehicles that are able to fly autonomously and can be apply on different kind of fields.

We expect an easy understanding of aero technology for non-aerodynamic students and an opportunity to discover how deeply aero technology is related to every day´s life

This course should be taken by students and professionals who want to be involved in the Aeronautical and Aerospace industry. Also, professionals who want to know more about unmanned aerial systems and understand how this system works and can be apply to satisfy different kinds of industrial services.

The main objective of this course is to introduce the students to the basic concepts in aerodynamics that allow understanding of the scientific concepts behind the development of flying machines that are very complex and required different engineering disciplines to achieve an optimum performance.

Also we will talk about:

- How to use your skills and knowledge on your own majors in the aeronautical field.
- Current regulation on the use of Unmanned Aerial Vehicles for commercial uses.
- Different types of sensors that are common use on unmanned vehicles
- Mission planning for unmanned vehicles applications

Code: ING339

Instructor:

Carlos Saito
Aeronautical Engineer – UAV Developer
United States Air Force Academy