

CAPABILITIES

SCHOOL OF ENGINEERING



National Autonomous University of Mexico



unam
donde se construye el
futuro

School of Engineering

Research. Laboratories and Centres.



School of Engineering, UNAM

Dean

Carlos A. Escalante Sandoval, PhD

caes@unam.mx

Coordination of Social and Productive Entailment

Gerardo Ruiz Solorio, MSc

grs@unam.mx

Circuito Escolar, Ciudad Universitaria, 04510, México, D.F.

(+52 55) 5622 0866

National Autonomous University of Mexico (UNAM)

The National Autonomous University of Mexico (UNAM) is one of the best higher education institutions in Latin America, with 113 undergraduate degrees and 41 graduate degree programs offered. The UNAM is present in all of Mexico and in seven countries. It is also home to national services such as the National Seismological Service (SSN), the National Library, the Periodicals Library and the Botanical Garden. Culture can be appreciated through its museums, historic sites, murals, graphic works, as well as a variety of artistic activities. The UNAM's institutes, schools and study centers, including the School of Engineering, are a reference for technology development and research.

School of Engineering at UNAM

With over 200 years of existence, the School of Engineering is the continent's oldest school of its kind. It combines tradition and modernity and has renowned university teachers and state-of-the-art facilities located in five campuses. The School serves a population of nearly 15 000 students and offers 13 bachelor's degree programs, including 12 credited by the Accreditation Council for Engineering Education (CACEI) and the recently approved Biomedical Systems Engineering program, as well as seven doctoral programs and 10 master's degree programs, all registered in the National Program for Quality Graduate Studies of the National Science and Technology Council. Engineering lecturers are prepared for teaching at the "Ing. Gilberto Borja Navarrete" Teaching Centre.

The School of Engineering carries out linkage projects with the public and private production sectors, involving professors and researchers from different areas of engineering. Examples of such projects on campus include: the Mechanical Design and Technological Innovation Centre, the Advanced Engineering Centre, the Micro Electro-

Mechanical Systems Laboratory, the Surface and Coating Engineering Center, the Materials Research and Technical Support Unit and the Unit of Modeling of Atmospheric, Biological and Industrial Flows. Its extensive infrastructure includes the majestic Palace of Mines (Palacio de Minería) as well as the following facilities in the states of Morelos, Querétaro and Nuevo León: the area of Hydraulics of the graduate degree program in Jiutepec, the High-Technology Center in Juriquilla, and the University Pole of Advanced Technology in Monterrey.

To make its progress and achievements known, the School publishes the peer-reviewed journal *Ingeniería, Investigación y Tecnología* and also makes use of other media: the Gazette *Gaceta de la Facultad de Ingeniería*, a newsletter (boletín), social networks, and radio broadcasts.

Culture is also a priority, as evidenced by the organization of various artistic activities such as the International Book Fair at the Palace of Mines, the Ars Iovialis Choir, La Tuna, a Theater group, as well as photo and film clubs.

Studies and research projects

Below is a survey of the capacities related to the studies and research projects that are carried out at the School of Engineering to provide solutions to the public and private sectors. These capacities are presented in five sections corresponding to the following five professional divisions: I. Civil and Geomatics Engineering; II. Mechanical and Industrial Engineering; III. Electrical Engineering; IV. Geosciences Engineering; and V. Continuing and Remote Education. The sixth section shows some activities undertaken by the Liaison Coordination.

Division of

Civil and Geomatics Engineering



Head of Division

Germán López Rincón MSc
germanlr@unam.mx / (+52 55) 5622 8001
Ext. 1142 y 1131

- Development, operation and maintenance of Geographic Information Systems.
- Generation of cartographic information using conventional and photogrammetric methods for addressing human settlement problems, marking boundaries, expert appraisals, adverse effects of hydro-meteorological disasters, planning, and regional urban development.
- Creation of topographic plans, charts and maps for natural resource evaluation and exploitation, preservation of ecological reserves, and delimitation of areas at risk.



- Topo-hydrographic and bathymetric studies.
- Geotechnical studies; technical opinions on the safety and behavior of building foundations; foundation design, construction procedures and maintenance for roads, freeways, airport runways and maneuver yards; and consultancy and research in geotechnical engineering.
- Hydrological studies and studies of the behavior of hydraulic structures.
- Regional analysis and modeling for extreme hydrological events like droughts and floods.
- Time analysis of the behavior of rivers and their impact on growing urban areas.
- Studies on soil pollution by heavy metals and oil, and design of remediation programs.
- Studies on the generation of hazardous waste to explore the possibility of reusing and treating it.





- Traffic engineering and urban planning studies.
- Assessment of projects with multiple objectives.
- Cost-benefit studies.
- Project management and supervision of works.
- Specialized training focused on the external sector.
- Experimental trials of structure elements and systems made of masonry, concrete, steel and new materials.
- Inspection, analysis and evaluation of the seismic behavior of structures (e.g., buildings, bridges, industrial structures).
- Instrumentation of structures to provide dynamic properties.
- Studies to estimate the vulnerability of structures to seismic movements.
- Analysis of the effects of wind on structures.

Division of

Mechanical and Industrial Engineering



Head of Division

Francisco Javier Solorio-Ordaz, PhD
fjso@unam.mx / (+52 55) 5622 9980 Ext. 518

Materials Research and Technical Support Unit

- Failure analysis of mechanical equipment and elements.
- Modeling of manufacturing processes.
- Characterization of mechanical properties of materials.
- Consultancy on manufacturing processes.
- Consultancy on corrosion deterioration problems.
- Development of materials for tribological applications.
- Design of toolkits.
- Consultancy on material-cutting processes.
- Research on sports biomechanics.
- Studies and evaluation of the corrosion resistance of organic coatings.
- Courses:
 - Materialography;
 - Mechanical testing of materials;
 - Failure analysis and fractography;
 - Corrosion and protection;
 - Stress-strain analysis using the finite element method;
 - Principles of biomechanics; and
 - Mechanical measures, fits and clearances.

Contact

Armando Ortiz Prado, PhD
armandoo@unam.mx / (+52 55) 5622 3006



Surface and Coating Engineering Centre

- Theoretical and practical courses:
 - Surface treatment technologies: Chemical nickel plating, Hot-dip galvanizing processes,
 - Thermal spraying technologies,
 - Sol-gel coatings, and
 - Thermo-chemical treatments.
- Courses:
 - Electrochemical techniques to evaluate the behavior of materials under corrosive conditions, and Heat treatment.
- Consultancy on processes of surface coating for industrial products;
- Research on surface technologies to recover parts, replace materials and extend the product life cycle of components;
- Research on cathodic protection systems and evaluation of the materials in use and proposal for alternative coated materials.
- Study on corrosion testing using electro-chemical techniques and evaluation of the behavior of materials and coatings under adhesive wear conditions using tests of the type "pin-on-disk".
- Vickers hardness testing, roughness testing, coating thickness measurement, and adhesion evaluation using the pull-off test.

Contact

Arturo Barba Pingarrón, PhD
arbapin5@unam.mx / (+52 55) 5622 3007 Ext. 113



Mechatronics Engineering



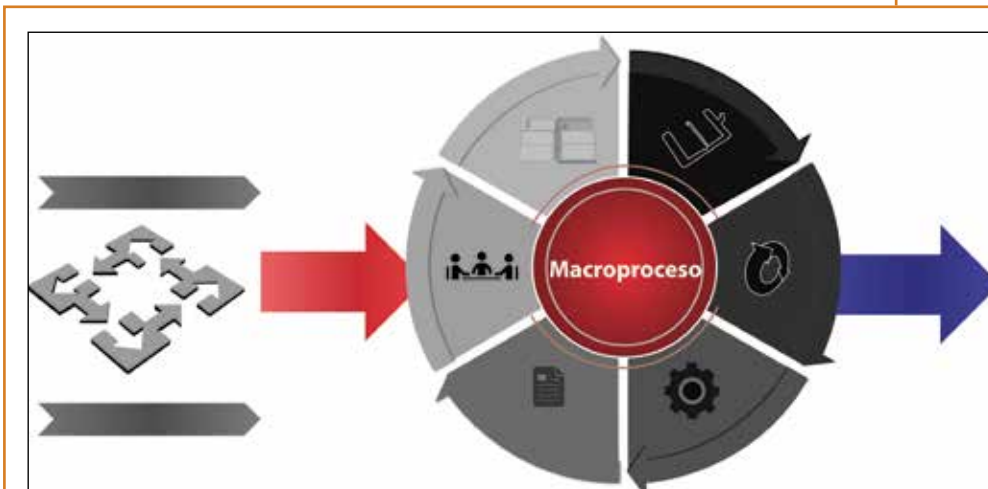
- Design of mechatronic products and processes.
- Industrial automation of machines and processes.
- Design of PLC industrial networks
- Design, programming and selection of robots; design of end effectors for robots.
- Training in mechatronics, industrial control and automation.

Contact

Edmundo Rocha Cózatl, PhD
e.rocha.cozatl@comunidad.unam.mx /
(+52 55) 5622 9986 Ext. 329

Systems Engineering

- Evaluation, selection, integration and implementation of programmes, projects and plans in relation to organizational diagnosis, strategic planning, business models, scenarios, linkage strategies, process improvement and design of organizational systems.
- Design, planning, analysis and financing of transportation systems.
- Quantitative operational analysis, demand modeling, and location of transportation services.
- Analysis and statistical handling (both spatial and inferential) of experimental data.
- Modeling, optimization (using both exact and heuristic methods), and simulation of organizational and production systems.
- Systems Engineering and Multi-Criteria Decision-Making.
- Organizational systems management using negotiation techniques, creativity and management skills.

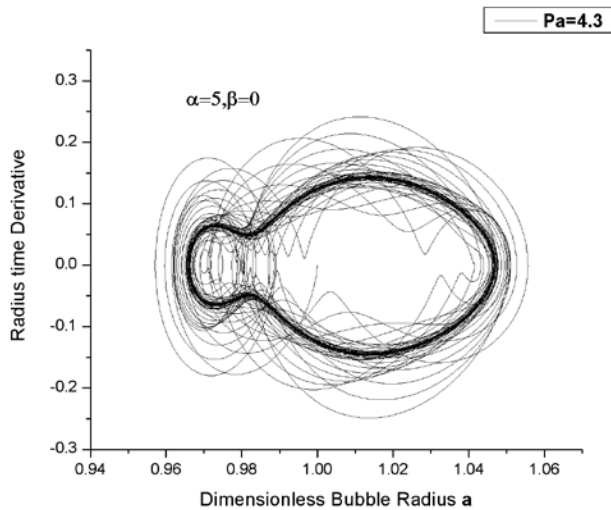


Contact

Benito Sánchez Lara, PhD
blara@unam.mx /
(+52 55) 5622 3281 Ext. 3

Thermofluids: Fluid flow and pumping

- Mixed convection in non-Newtonian fluids; calculation of global heat transfer coefficients; and visualization of flow patterns and, when possible, of the velocity field.
- Flows through capillary tubes and porous media under temperature gradients, for Newtonian as well as non-Newtonian fluids.
- Loss in pipes for non-Newtonian fluids.
- Experimental and theoretical ultrasonic cavitation studies using viscoelastic fluid models combined with hyperelastic material models.
- Analysis of pumps working with bubbly fluids and helicoaxial pumps.



$$\left[\frac{d^2 a_2}{dt^2} + \frac{3}{2} \left(\frac{da_2}{dt} \right)^2 + \frac{4}{Re} \frac{da_2}{dt} \right] = p_l(a_2) - p_\infty \sin \omega t$$

Contact
Rogelio González Oropeza, PhD
rog1950@unam.mx / (+52 55) 5622 9980
Ext. 232

Thermofluids: Research and development in the areas of Internal-Combustion Engines and Control of Pollutant Emissions



- Programming and design of e-cards for: control and monitoring of vehicles, dynamometers of bench and chassis for engines, cars and motorcycles, and data acquisition systems. Calibration and tuning of gas analyzers.
- Install and assembly of dynamometers, engines and accessories for testing on engines and vehicles.
- Development and / or updating of driving cycles, that represent the typical way of driving in a city or region, including urban, semi-urban and motorway areas, taking into account various factors as, driver, roads and vehicle technology.



Mechanical Design and Technological Innovation Centre

- Research and development to produce innovative products and special-purpose technological systems.
- Research and development to achieve the best products of their kind globally, and application of sustainable approaches to design products.
- Design of automotive components and development of test models.
- Improvement of products and services following user centered approach, life cycle product and evaluation of the environmental impacts.
- Analysis of products and systems using manufacturing and assembly design techniques.
- Development of projects in the strategic areas of: space technology, automotive technology, plastics, and mechanical design.
- Analysis of structures to optimize design.
- Stress analysis of parts under heavy loads.



Contact

Adrián Espinosa Bautista, PhD
adrianeb@unam.mx / (+52 55) 5622 9985
Ext. 304

- Research on technologies to develop prototype vehicles.
- Strain analysis of parts under heavy loads.
- Research on biodegradable materials.
- Design of molds for plastic parts.
- Design and processing of composite materials.
- Analysis of cavity filling.
- Design of toolkits for plastic part manufacturing processes.
- Identification and analysis of defects in plastic parts.
- Design of plastic products.
- Problem analysis and generation of solutions by applying TRIZ theory.
- Analysis and problem solving using nature-oriented methods.



- Comprehensive operation diagnosis: process mapping, determination of bottlenecks, and factory performance and capacity indicators.
- Implementation of forecast and inventory management systems.
- Execution of simulation projects for systems in operation
- System design through simulation.
- Formulation of business models and plans.

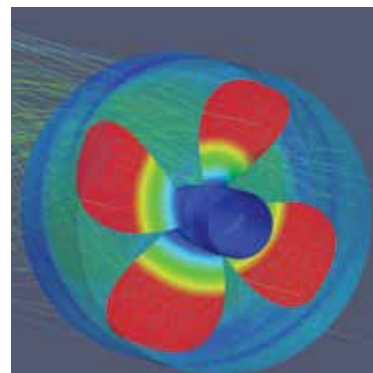
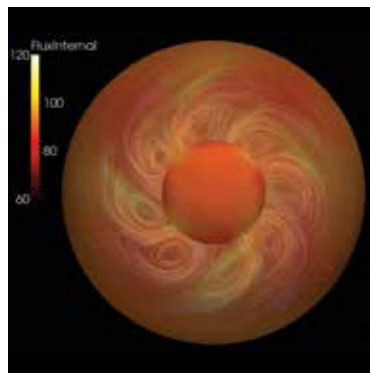
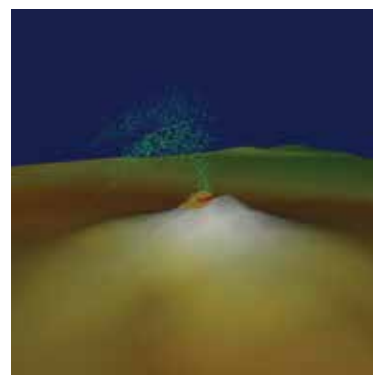
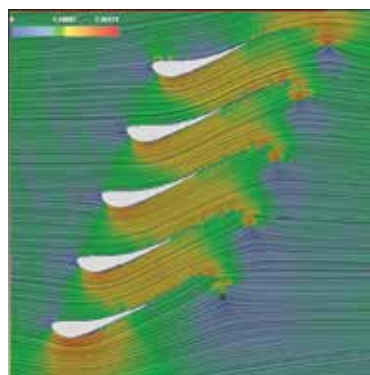
Contact

Silvina Hernández García, MSc
silvina_hg@yahoo.com / (+52 55) 5622 9983
Ext. 508 y 507



Thermofluids: Unit of Environmental, Biological and Industrial Flows Modeling

- Modeling of atmospheric fluids at the urban and industrial scales.
- Study of explosion and fire events at the urban and industrial scales.
- Thermal and dynamic analysis of turbomachinery.
- Analysis of blood flow and design of biological devices with applications aimed at replacing heart muscle.
- Fuel flow simulation to determine the volume of containers with complex geometry (tankers and tanks for the aeronautical and automotive industries).



Contact

Rubén Ávila Rodríguez, PhD
ravila@unam.mx / (+52 55) 5622 9988
Ext. 229

A woman wearing a white lab coat and a grey hairnet is seated at a desk in a laboratory. She is looking at a computer monitor that displays a technical diagram. On the desk, there is a stack of blue electronic equipment, including a device labeled 'Fregat 35A-400 JACKSON' and another labeled 'PROM-CHASSIS THERMO-CONTROL'. A keyboard is visible in the foreground. The background shows a laboratory setting with a window and other equipment.

Division of **Electrical Engineering**

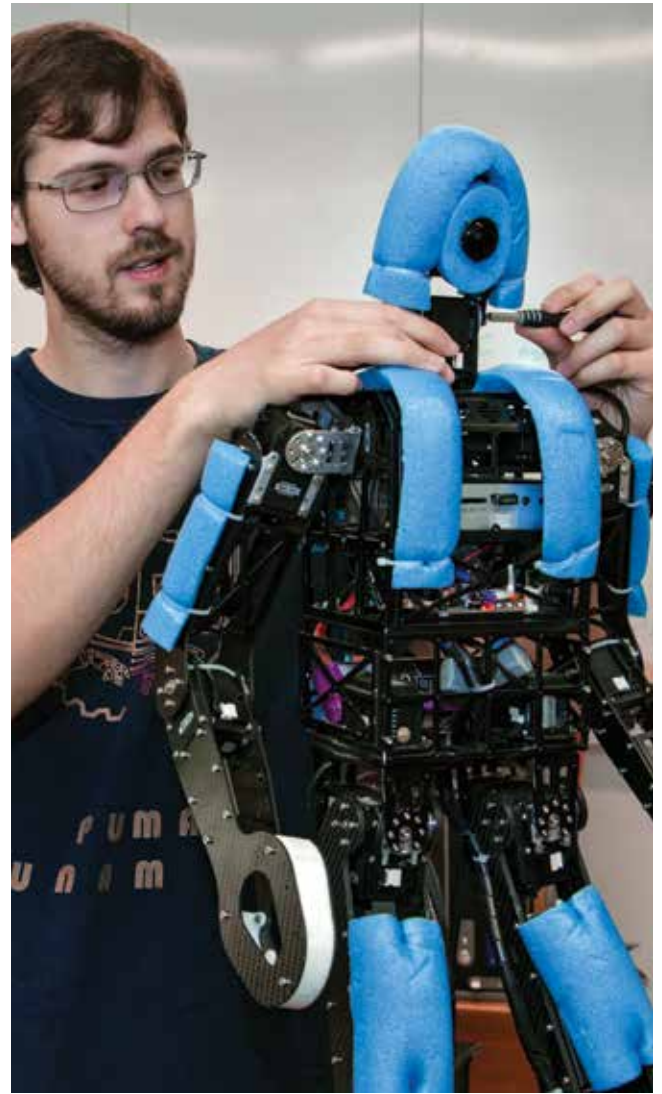
Head of Division

Orlando Zaldívar Zamorategui. Eng
zazor1@fi-b.unam.mx / (+52 55) 5622 3116

- Analytical instrumentation aimed at protecting the environment in wastewater treatment facilities, and monitoring of atmospheric pollutants.
- Virtual instrumentation for measuring and processing physical variables in standard and industrial computer equipment.
- Automatic control for the analysis of dynamic processes; and design and implementation of sensors, actuators and controllers in industrial processes.
- Automation systems for industrial monitoring and control, and implementation of microcontrollers and software for the design of special automation solutions.
- Technological innovation in the design of intelligent electronic devices that are very energy-efficient and highly sustainable, with a view to preserve the environment.
- Control theory applied to systems analysis and the design of new, high-performance nonlinear control schemes.



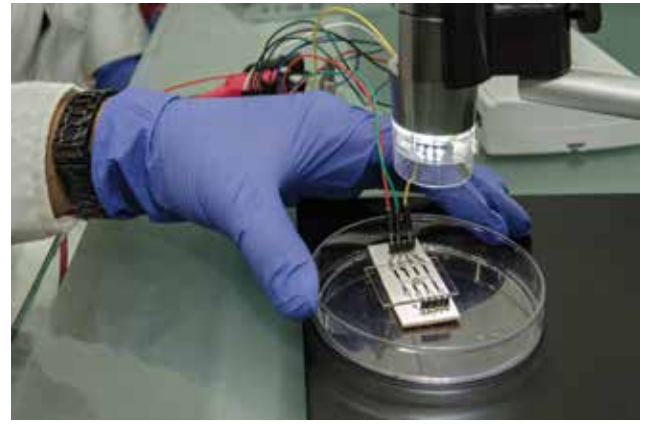
- Biomedical Engineering for the design of electric, electronic and computing devices and systems, and their implementation in areas related to medicine and biology.
- Digital signal processing (of voice, audio, image and video signals); Data compression and encryption; Digital signal processing architectures; Speech synthesis and voice recognition.
- Advice on language technologies in trials that use recordings, as well as for the implementation of speech coding in cell phones.
- Analysis and processing of medical images to help in diagnosis.
- Processing of remote sensing images.
- Pattern recognition; Computer vision; Industrial vision.
- Artificial intelligence and robotics; Service robots; Man-machine interface.
- Implementation of speech synthesis and recognition systems in public and private companies.
- Beam formers for the processing and filtering of spatial audio signals.
- Signal acquisition and transmission interfaces.





- Projects of energy conservation in thermal and electrical processes, advising on possible changes and profitability.
- Energy efficiency, and basic and detailed thermal engineering for industrial boilers, piping systems, steam plants, cogeneration, and electricity generation.
- Financial evaluation of investment projects in the energy area, including the acknowledgment and management of risks.
- Fuel management studies for nuclear boiling water reactors (BWR); Safety analysis and probabilistic safety assessment of BWR reactors.
- Innovation and development of energy modeling systems.
- Production and use of liquid, solid and gas biofuels.
- Software and database engineering; Information analysis, development, maintenance and management through software solutions for database integration, stand-alone applications, web applications, and web services.

- Design and development of video games and of intelligent systems based on language technologies.
- Advice on computer networks and security.
- Development of bio-MEMS microdevices for biomedical and biochemical applications, and of laboratory-on-a-chip (lab-on-a-chip) micro analysis systems (LOCs).
- Phased-array antennas; Development of flat-surface antennas, a technology applicable to the development of anticollision radars and mobile communications.
- Inertial systems (microaccelerometers and gyroscopes), devices that help to maintain stability and detect an object's speed changes, useful for the control of airbag deployment and powertrain's stability and comfort.
- Surface acoustic wave devices applied to different types of systems: inertial, electronic, microfluidic, signal processing, electronic, and telecommunication systems.
- Analysis and design of telecommunications networks and of optical and microwave devices.
- Analysis, design and implementation of wireless communication protocols such as WLAN, GSM, 3G, 4G-LTE, 5G-LTE, and protocols based on software-defined radio (SDR) for intelligent transportation systems (ITS).





- Projects to design and develop charging system prototypes for satellite platforms.
- Electromagnetic compatibility (EMC) analysis for the provision of technical recommendations on the design of electrical, electronic and communications systems; Characterization of the electromagnetic emission of embedded circuits.
- Development of military-standard radiated emission tests in anechoic chamber for the aeronautical, automotive and electrical appliance industries.
- Communications via optical fiber, cable elements, optical filtering, fiber Bragg gratings, and long-period optical fiber; Sensors for various physical parameters based on optical fiber, refractometry, liquid level measurement, etc.; Structure monitoring using laser and optical fiber; Laser material processing; Laser applications in technology and scientific research.
- Analysis, evaluation and development of space projects (telecommunications, Earth observation and technological projects).
- Development of professional updating schedules designed to meet the specific needs of companies, through both in-class and online courses, diploma courses and specializations.



A photograph of two geologists in the field. One geologist, wearing a maroon shirt, grey cargo pants, and a tan hat, is crouched on the left, pointing at a rock outcrop. The other geologist, wearing a grey shirt, light blue pants, and a backpack, stands on the right, also pointing at the rock. The rock outcrop is large and shows distinct horizontal and wavy sedimentary layers. The background is a steep, rocky hillside with some green vegetation at the top.

Division of

Geosciences Engineering

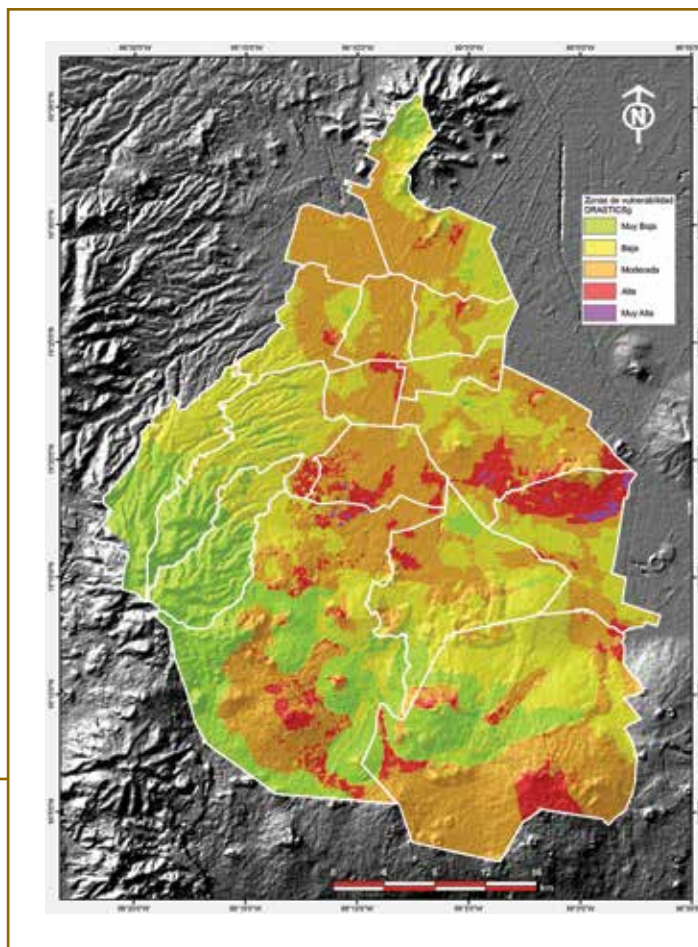
Head of Division

Enrique Alejandro González Torres, PhD
eagtgaia@unam.mx / (+52 55) 5550 0040

- Mineral exploration and increase of mineral reserves.
- Search for sources of drinking water supply.
- Location and evaluation of disposal sites for hazardous and special-handling waste.
- Characterization and remediation of oil-contaminated sites.
- Geological and geotechnical studies for roads.
- Quantitative assessment and mathematical modeling of aquifers.
- Geological and geotechnical studies aimed at preventing risks from landslides on natural hillsides.

Contact

Alberto Arias Paz, Bs
ariaspaz@unam.mx / (+52 55) 5622 0850
Ext. 125





Mining and Metallurgical Engineering



- Quantitative chemical analyses of minerals in the dry way, in the wet way and by atomic absorption spectrometry.
- Metallurgical studies for the concentration of minerals.
- Geochemical studies and environmental impact assessment of mining waste.
- Design of pumping systems for underground mining.
- Slope stability analysis in open-pit mines.
- Rock mechanics studies in open-pit and underground mines.

Contact

José Enrique Santos Jallath, MSc
jesantos@unam.mx / (+52 55) 5622 8053
Ext. 165



Geophysical Engineering

- Geophysics applied to civil engineering.
- Hydrogeophysical characterization of aquifers.
- 2D and 3D electrical resistivity tomography.
- Seismic methods applied to geotechnics, environmental geophysics, and urban geophysics.
- 2D and 3D gravity and magnetics land surveys.
- Integrated near surface geophysics methods.
- Seismic Site Characterization.
- Structural Vibration Analysis.
- Microseismic Monitoring.
- Petrophysical and well-logging studies.

Contact

David Escobedo Zenil, MSc
dzenil@unam.mx / (+52 55) 5622 0850
Ext. 102





- Characterization of naturally fractured cores in the laboratory.
- Mechanics studies of oil pools.
- Analysis and characterization of oil pools by pressure tests.
- Analysis of flow instability in oil pools with pneumatic pump.
- Modeling of multi-phase flow and heat transfer in oil pools and pipelines.
- Basic studies of flow assurance.
- Development of computer tools applied to petroleum engineering.
- Studies on well completion and repairing.
- Rheological studies of drilling fluids.
- Characterization and design of cement slurries.
- Characterization of fractured cores.

Contact

Héctor Erick Gallardo Ferrera, BS

erick.gf@unam.mx / (+52 55) 5622 3017

Ext. 101



A photograph of three men in a professional or educational setting. They are gathered around a desk, looking at a laptop and a tablet. The man on the left is pointing at the laptop screen. The man in the middle is looking at the tablet. The man on the right is looking at the laptop. They are all focused on their work. The background shows a classroom or office environment with a window and some equipment.

Division of

Continuing and Remote Education

Head of Division

Víctor Manuel Rivera Romay, MSc
victor.rivera@mineria.unam.mx / (+52 55) 5623 2901 y 02

Lo que pasa en el mundo de la **ingeniería**,
lo enseñamos en

Minería

Educación continua y a distancia de la Facultad de Ingeniería ®

- Training of engineering professionals through courses, diploma courses, workshops and conferences.
- Academic programs of knowledge updating and deepening in all disciplines of engineering.
- Training to improve the personal, management and entrepreneurship skills of engineers.
- Specialized assistance to public and private institutions through exclusive academic programs.
- Design of courses, diploma courses and workshops according to the specific needs of the requesting entities.



- In-class teaching can be carried out in the classrooms of the Palace of Mines, in the classrooms and laboratories of the School of Engineering, or in another facility, as requested by the contracting institution. Teaching can also take place in any part of Mexico or anywhere abroad.
- Online teaching is done through the Campus Virtual Minería, and accessing the academic programs from any part of the world requires only an Internet connection. Online courses and diploma courses meet the highest academic standards.
- Support to degree completion by broadening and deepening knowledge through 240 hours of courses and/or diploma courses, or through a group written assignment.
- Consultation and loan of the most current titles in engineering at the "Ing. Bruno Mascanzoni" Information and Documentation Center, located on the ground floor of the Palace of Mines.





- Development of academic, cultural or business activities in different facilities of the Palace of Mines.
- Manuel Tolsá Museum located in the Palace of Mines, a space dedicated to disseminating the sculptural and architectural work of this brilliant Valencian master artist.
- Presentation of temporary exhibitions of painting, sculpture and photography.
- Guided tours to the different rooms of the Palace of Mines and organized tours to Manuel Tolsá's architectural works in Mexico City's historic center.



Liaison



Televisa



RADIOPOLIS



INECC

INSTITUTO NACIONAL
DE ECOTOXICIDAD Y
CALIDAD AMBIENTAL



Comisión Federal de Electricidad



COLOMER

**THE
GROUP**



**TRIBUNAL ELECTORAL
del Poder Judicial de la Federación**



INE

Instituto Nacional Electoral

SENER

SECRETARÍA DE ENERGÍA



P&G



**INDUSTRIAL
BLOQUERA**

SHCP

SECRETARÍA DE HACIENDA
Y CRÉDITO PÚBLICO



PEMEX



SNF FLOERGER

BANBRAS





Liaison with the following educational institutions:



Massachusetts
Institute of
Technology



國立台灣大學
National Taiwan University

Berkeley
UNIVERSITY OF CALIFORNIA



UNIVERSITY OF
SOUTHERN CALIFORNIA

UC RIVERSIDE
UNIVERSITY OF CALIFORNIA



- **Stanford University**
- **University of California, Berkeley and Riverside campuses**
- **University of Southern California**
- **Texas A&M University**
- **Technische Universität München in Munich, Germany**
- **Moscow Aviation Institute**
- **Universidad Libre in Colombia**

Apart from liaison with these universities, the School of Engineering also has agreements with Robert Bosch, Continental, and General Electric companies, which offer scholarships and updating courses to students.



BOSCH



Liaison with private companies

- **Sustentabilidad en Energía y Medio Ambiente, S.A. de C.V.**
Design and supervision of the manufacture of a prototype tank to produce biogas from restaurant food waste.
- **Televisa**
Master's degree program in Telecommunications designed specifically for this television station.
- **AGO Proyect Company**
Verification of planograms in self-service stores by means of computer vision.
- **Industrial Bloquera Mexicana**
Determination of the maximum resistance index of masonry test specimens and generation of stress-strain behavior curves.
- **Fundación Sebastián A.C.**
Automation of a transformable cube using different programming sequences.
- **Radiopolis**
Master's degree program in Broadcasting designed specifically for this radio station.
- **Empresa SNF Floerger**
System to monitor and determine sludge water content by means of computer vision for polymer dosing control in filter press dewatering in wastewater treatment facilities.
- **Ford Motor Company**
Development of a test bed to evaluate the life of car windows beyond 80 000 opening-closing operating cycles, during eight days of uninterrupted operation.
- **Procter & Gamble Manufactura**
Environmental damage assessment at the warehouse of the Vallejo factory.
- **Estacionamientos Radiales Automatizados S.A. de C.V.**
Programming and activation of a prototype seven-level, 82-space automated circular parking garage.

- **Diploma in Project Management of global standard based on the Project Management Book of Knowledge (PMBOK®).**

Since 2013, the School is certified as a Registered Education Provider (REP) by the Project Management Institute (PMI®). This certification is granted to an educational institution after reviewing its internal processes and adherence to the thematic contents. The certification was successfully renewed in February 2015.

- **Eficiencia Informativa**

Analysis of multimedia segments to identify television advertising patterns.

- **ISA Corporativo Industrial y Empresarial S. de R. L.**

Specialized services in Reservoir Engineering.

- **Colomer México**

Development of an ampule filling and sealing system with three rotating heads, capable of filling and sealing 120 ampules per minute.



Liaison with government organizations

Pemex Exploración y Producción

- Determination of residual oil saturation in secondary gas caps and water-filled areas of the Ku-Maloob-Zaap oil field.

Secretariat of Energy

- Integrated Energy Sector Modeling System that includes strategic sustainable development themes: the economy, the environment, and energy security. Participating entities include, besides the School of Engineering, the Economic Research Institute, the Applied Mathematics and Systems Research Institute, and the Department of Computing and Information and Communication Technologies, all from the UNAM.

Secretariat of Communications and Transportation

- Geological and geotechnical study of Branch Camelinas of the Southern Beltway of Morelia.
- Supervision of a hydrogeological study to evaluate the environmental impact that will result from the construction of a new stretch of the Atizapán-Atzacmulco highway from km 35+000 to 65+000 in Villa del Carbón, State of Mexico.
- Geological study of the stretch from km 578+000 to 602+534.17 of the modified Tijuana-Ensenada highway route.

Secretariat of Finance and Public Credit

- Evaluation of the structural safety and stability of the Fiscal Attorney's Office building.

National Hydrocarbons Commission

- Specialized technical support for geological, structural, sedimentary and reservoir modeling of the following fields of the Chicontepec paleochannel: Furbero, Coyotes, Palo Blanco, Humapa, Miquetla and Aragón, as well as model updating with new information from the Tajín and Agua Fría fields.
- Non-binding specialized technical advice on at least 19 documents of different areas of expertise on Mexican exploratory areas and oil fields.

National Institute of Ecology and Climate Change

- Study to prepare a management system for updating and improving the quality of the Greenhouse Gas Emissions Inventory.
- Creation and development of the Mexican National Chemicals Inventory to provide information on trade flows of chemicals and prevent the risks posed by their handling.

Federal Electricity Commission

Electricity Generation

- Institutional UNAM project on service robots.
- Drafting of opinions on the project "Conversion to Dual Combustion of Unit 3 of the 'José Aceves Pozos' and of the 'Juan de Dios Bátiz Paredes' thermoelectric plants".
- Drafting of opinions on the production infrastructure of the Electrical Engineering Management Office and on the technical, economic and environmental feasibility of the public investment project "STL 2021 Reduction of Energy Losses During Distribution".

Nuclear Power Plant Management

- Probabilistic safety assessment training and consultancy and simulation of severe accidents for the Licensing and Training areas.
- Development of risk monitors for the Laguna Verde power plant.
- Updating of the emergency operating procedures at the Laguna Verde power plant in accordance with the 2nd review of the EPG/SAG guidelines.
- Implementation of the Severe Accident Guidelines at the Laguna Verde power plant in accordance with the 3rd review of the EPG/SAG guidelines.

Central Production Regional Management Office

- Development of a system with a graphical interface for forecasting the dispersion of air pollution clouds in urban areas.

School for Works Supervisors

- Development of online diploma courses dealing with the construction of transmission lines and electric substations, with 509 work supervisors trained from 2009 to 2014 in the six CFE regions.
- Diploma in Combined Cycles, with 223 participants trained from 2007 to 2014.
- Development of two online master's degrees: Energy Systems and Hydraulic Construction.

Power Generation Plant

- Implementation of a methodology for assessing aquifer vulnerability and hydrogeological risk in sources of underground water supply in a power generation plant.

General Management of University Heritage

- Topographic survey of internal and external roads on UNAM's main campus.

Federal Electoral Tribunal

- Development of a physical inventory and inventory monitoring system for the Tribunal.

National Nuclear Safety and Safeguards Commission

- The UNAM provides ongoing advice on the implementation of a training and certification plan for nuclear facility operators.

Banobras

- Development of a portfolio of infrastructure projects to meet the needs of the population of municipalities, and proposal of potential sources of financing for their implementation.

National Electoral Institute

- Development and quality control of electoral process materials from 1998 to date.

Institutional Revolutionary Party (PRI)

- Structural inspection of facilities and project for strengthening a parking garage in Mexico City's offices.



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