West Virginia University
BENJAMIN M. STATLER COLLEGE OF ENGINEERING AND MINERAL RESOURCES

Consejo de Ciencia y Tecnología del Estado de Querétaro
CONCYTEQ

INDUSTRIAL OUTREACH PROGRAM IN MEXICO MINI-REPORT 2018

22 years building bridges and bridging the gap between academia and industry in Mexico and the USA...!!

This Program aims at graduating highly competitive engineering graduates from Mexico and the USA, capable of working with professionals from different backgrounds and cultures, in realistic industrial scenarios abroad. USA students team up with Mexican students and conduct an experiential learning activity under the supervision and guidance of engineers from industry and faculty members from Mexico and USA universities. This is a full professional and cultural immersion that focuses on "global competencies" and practical industrial experience while students earn credits towards their degrees. *Join us this Summer 2019...!!!*

Institutions involved in the Program , 2018

Universities

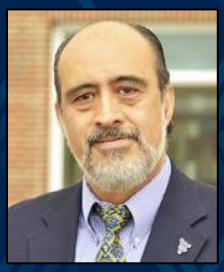
- West Virginia University (WVU)
- Council of Science and Technology of the
- State of Queretaro (CONCyTEQ)
- University of Nevada Reno (UNR)
- Autonomous University of Queretaro (UAQ)
- Technology Institute of Queretaro (ITQ)
- Advanced Science and Applied Technology
- Research Center- (CICATA-IPN)
- Aeronautic University in Queretaro (UNAQ)
- Technological University of Queretaro (UTEQ)
- Tech. Institute of San Juan del Rio (ITSJR)
- Tech. University of San Juan del Rio (UTSJR)
- Tech. Univ. of Santa Rosa de Jauregui (UTSRJ)
- Polytechnic University of Queretaro (UPQ)

Companies and Centers

- CIDEC – ConduMex – Wire and cables R&D
- CIDESI – Industrial National R&D Center
- CIATEQ – Technology National R&D Center
- CENAM – Metrology Center, R&D Standards Tech.
- IMT- Transportation Research Center
- CASE NEW HOLLAND – Agricultural machinery
- SAFRAN MESSIER SERVICES – Landing gear sys.

Welcome by Program Leaders

Mtro. Raul Iturralde Olvera, Director of CONCyTEQ welcomes WVU students to participate in the Industrial Outreach Program in Mexico, also known as "Program a Bicultural de Alcance Industrial." CONCyTEQ is committed to promote and support the interaction between universities, industries and research centers in Queretaro. CONCyTEQ also supports and coordinates the selection of the best students from Queretaro to spend the spring semester at WVU as part of the IOPM Program.



Dr. Victor H. Mucino is a Professor of Mechanical and Aerospace Engineering at West Virginia University. He is also the director and founder of the IOPM at WVU. He leads the day-to-day operations of the Program in Queretaro, acting as advisor and supervisor of all students and projects and provides the overall stewardship of the Program in Queretaro and at WVU.

Renewal of WVU-CONCyTEQ Agreement

From left to right: Lic. Mauricio Palomino, Mtro. Raul Iturralde, Dr. Gene Cilento Dr. William Brustein, Lic. Alfredo Botello, Dr. Victor Mucino, Dr. Marco Carrillo

A major event took place this year, with the visit of Dr. William Brustein, WVU Vice-President for Global Strategies and International Affairs and Dr. Gene Cilento, Dean of the College of Engineering and Mineral Resources at WVU, who visited Queretaro to sign the renewal of the Agreement between WVU and CONCyTEQ (Council for Science and Technology of the State of Queretaro) for a period of five (5) years. The Signature Ceremony took place at the Secretariat of Education of the State of Queretaro on July 19, 2018. The Ceremony was presided by Lic. Alfredo Botello, Secretary of Education for the State of Queretaro and by Mtro. Raul Iturralde Olvera, the Director of CONCyTEQ. The event was covered and reported in the local networks and newspapers of Queretaro.

Program Description and Activities

Senior engineering students from the West Virginia University have the opportunity to participate in the Industrial Outreach Program in Mexico (IOPM) during the summer of each year (June and July), to earn a total of 9 credits toward their BS degree requirements. This Program is open to students in various areas of engineering including mechanical, aerospace, electrical, industrial and civil engineering. In this Program, students are teamed up with Mexican students from local universities and conduct meaningful engineering projects in industrial sites where they work full time for 8 weeks, under the supervision of practicing industrial engineers. Faculty members from the USA and Mexico provide guidance and oversight to all student teams and projects. Practical engineering problems from well-established companies in Mexico are presented to each team, with specific objectives and technical deliverables to be attained during the 8-week duration of the Program. Students are required to report on a weekly basis and produce a final report and a presentation, which are delivered to the company at the conclusion of the 8 weeks.

Program Objectives

- To add value to engineering education and to produce top quality engineering graduates with global competencies, by providing a meaningful industrial experience in a multicultural and multilingual professional environment.
- To bring value to industry through the projects assigned to the participating students, who apply practical engineering skills, interpersonal and communication skills and ultimately leadership skills to attain deliverables.

- To bring, faculty members and engineers from industry together to share expertise, capacities and experiences in formulating and solving meaningful engineering problems.

Housing and Logistics of Program

Student housing neighborhood in Queretaro
(From Google Maps)

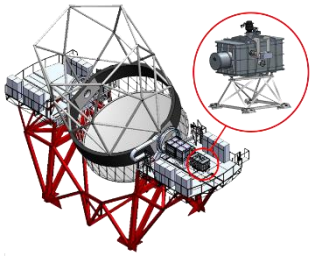
Students are placed in home-stay with local families in a well-established residential area of Queretaro (Col. Alamos 2a. Sec.) The families provide safe, healthy, comfortable and friendly family environment for the students, who are in close proximity to each other all the time. Homes are conveniently located near shopping areas, recreational parks, convenience stores, and just a few minutes from the colonial downtown area of Queretaro. Room and board include daily meals, a bedroom and cleaning service for the duration of the stay. Students are also provided with daily transportation to and from their home to the workplace (typically a 15 to 30-minute commute) using vehicles provided by the host institution, CONCyTEQ, and local universities. A typical weekday starts at 7:30 outside their homes in order to be at the industrial site by 8:00 am. The return commute starts at 5:00 pm. On Saturdays a culture class is offered by the University of Queretaro followed by a field trip to parks, museums, towns and villages nearby. On Sundays we rest.

Mexican Students at WVU, Spring 2018

Just like in the previous five years, a very select group of four (4) Mexican students from three (3) major universities in Queretaro (UAQ, ITQ and UNAQ) spent the spring semester of 2018 at WVU, conducting a one semester study-abroad. These students carried a full academic load of four (4) regular courses of the Junior/Senior Year (3rd/4th year) plus the involvement in an undergraduate research student project. Students were highly motivated to deliver top performance in all their classes and were encouraged to contribute significantly to each research project they were assigned. This cohort of Mexican students traveled back to Mexico to join the group of six (6) students from WVU, who participated in the summer Program in Queretaro. Ten (10) additional students from local universities joined the summer activity producing twelve (12) intermixed teams of two (2) to three (3) students per team, who worked on seven (7) industrial sites. These projects are briefly described next.

Project Descriptions, IOPM Summer 2018

1. Team CIDEC-ConduMex. In cable extrusion lines, it is necessary to cool down the insulation before any bending of the cable occurs, to prevent its deformation and meet quality parameters. The project was focused on a thin, PE insulated cable. An analysis based on external convection and transient heat conduction was used to make calculations for the trough length required to get a critical temperature in the center of the cable. The results showed that the different ways to decrease this length have important limitations and their effects are not effective enough to meet the desired production speed.



2. Team CIDESI. Worked on a collaborative project with various centers focused on developing the preliminary design for the new San Pedro-Martir, Optical Telescope, scheduled to be operational in 2023 in Baja California. Specifically, the team was tasked with designing, analyzing, and proposing a retractable mirror cover system, safety locking pins, brakes and additional components for the telescope. The student team conceptualized, modeled and analyzed these components for design feasibility purposes and produced simulations of their performance.

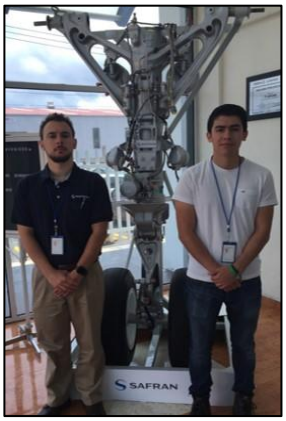
3. Team CASE NEW HOLLAND. This was the starting phase for the pilot usage of Tecnomatix Plant Simulation by Siemens, to model the tractor final assembly line for the purpose of line balancing. An analysis of the existing logistics data and the simulation input requirements was made to determine relevant information. This determined the accuracy that our team demonstrated in the first draft model. The methods to carry out the project were built from suggestions found in public internet forums, by two authors of books on the subject, by a user manual for the software, and from the team's ideas. Preliminary results were discussed with the supervisors to identify improvements that could be made based on their feedback.

4. Team CENAM-Dynamometer. This project involved the analysis of results from the characterization of Remote Sensor Device (RSD) for the performance of a conformity emissions assessment on the equipment RSD4600 at Mexico's National Metrology Center (CENAM). Experiments were performed on a spectrophotometer to analyze the wavelengths in which the exhaust gases of an internal combustion engine absorbed the laser by means of spectroscopy in order to compare these wavelengths to the ones that are analyzed by the remote sensor device. Glass chambers with different sizes were built with the intent to enclose the standardized gases used in the experiments on the spectrophotometer. The chambers had quartz windows to allow a bigger spectrum (190 to 3300 nm) to be analyzed by the equipment.

5. Team CIATEQ- CIATEQ As an effort in enhancing the capabilities of modern day high temperature protective coatings, the Air Force Office of Scientific Research (AFOSR-USA) teamed up with Consejo Nacional de Ciencia y Tecnología (CONACYT-MEX) are developing a 3 year collaboration research work, whose main objective is to design layered materials using elastic energy formulation via both analytical and FEA models, including a study in new oxide composition synthesis, processing and layered manufacturing science and conducting a detailed performance testing under harsh environments.

6. Team IMT. In spite of engineering testing performed, many heavy vehicles fail to restart their forward motion on slopes after a stop. This is due to factors not considered in the analysis like: bad distribution of weight, max/min torque required to name a few.

The Official Mexican Standard is designed to regulate the heavy vehicles allowed to operate in the Country. The standard provides acceptable vehicle configurations to insure that the given vehicles will operate safely on Mexican roads. This case study follows the government regulations but also integrates in knowledge from other engineering organizations that have conducted research on startability of commercial vehicles.



7. Team Safran-Aerospace. This project focused on designing, researching, building, and testing methods to detect foreign object debris (FOD) during and after the assembly process. A device will be used to test for possible foreign objects during the assembly as a FOD detection critical processes. The team also has conducted research on post assembly detection systems and have made recommendations based on their findings. The project has been producing successful results and a new FOD prevention guide has been started.

Culture Class, Mexican Cultures, Summer 2018

FCLT 260 Cultures of Mexico Class. An equivalent of this 3-credit course is taught by the Autonomous University of Queretaro with Prof. Shaila Alvarez who has developed an outstanding course for this Program with oversight by Dr. Angel Tuninetti of WVU. The course is offered on Saturdays from 9:00 to 12:00 at the UAQ Downtown Campus, and is followed by field trips to archeological sites, museums, parks, villages and markets. In this course students learn about language, traditions, history and culture, including gastronomy, folklore and cultural sightseeing. The City of Queretaro offers outstanding cultural activities during the summer. The International Jazz Festival in the Summer is a tradition, free of charge in the he main plazas of colonial downtown. The festival "Iberica Contemporanea" is another summer cultural event free of charge. The journey ends with a long weekend in Cancun and the Maya Riviera.

IV FESTIVAL INTERNACIONAL DE DANZA
IBERICA
CONTEMPORÁNEA
EN MÉXICO • QUERÉTARO

Distinguished Visitors

This year there were several other distinguished visitors to Queretaro. We had the visit of **Ms. Alexis Robertson** from the University of Nevada-Reno, who is our liaison to expand the IOPM Program and to integrate UNR in the future. She is an outstanding ambassador for the Program .

Dr. Angel Tuninetti, former Chair of the World Languages, Literature and Linguistics at WVU also visited Queretaro to provide support and oversight to the Mexican Cultures class taught by Prof. Shaila Alvarez of University of Queretaro.

Dr. Majid Jaridi visited Queretaro for few days to attend some of the student's presentations and visit some of the industrial sites and technology development centers, to see student groups at work. He provided valuable suggestions and insightful observations for the Program.

Mrs. Doina Jickish and he husband **Jay** to discover Queretaro and to accompany students through a regular day journey. With her experience as the International Student and Scholar Director at WVU, she was able to provide excellent observations of the Program logistics and the value of the experience for students.

Dr. David Mebane visited during the last week, to attend the final presentations, of all the students and the poster session. Dr. Mebane has been involved in the Program in the last three years and will participate in the Program as an advisor in Queretaro and at WVU for the Program in the future.

Testimonials

"I came into this Program not knowing what to expect. I had never been out of the country before, only knew a few words in Spanish and did not know anyone else in the Program. This experience not only helped me improve and expand my engineering knowledge, but also myself as an individual. I learned engineering concepts, conversational Spanish, and to live with others from different backgrounds and cultures." ***Emily Deaver, CEE, Summer 2016****.*

"Over this summer I had the great opportunity to travel abroad in Mexico. Before the trip there I knew I was going to have a great time, but I didn't realize at the time how amazing it would truly be." ***Matt Kozlowzki, MAE, Summer 2017****.*

"This Program opened doors for me that I never considered. The trip is a great value and a once in a lifetime experience. You receive your capstone requirement but so more with the traveling experiences and the relationships you develop with people along the way. the food is great, the hospitality is better, and you will learn a lot about the Mexican culture and about yourself. " ***Scott Mock, MAE Summer 2018****.*

IOPM 22-YEAR SUMMARY OF ACTIVITY

Institutions Involved	Students	Faculty	Industrial Liaisons	Industries Sites	Projects developed
Local Institutions: • CONCyTEQ • University of Guanajuato • University of Queretaro (UAQ) • Institute of Technology of Queretaro (ITQ) • Tech. University of San Juan del Rio. • ITESM (Tec. De Monterrey) • CICATA (IPN) • Aeronautical University in Queretaro (UNAQ) • Polytechnical Univ. of Queretaro (UPQ) • UNAM • Tech. Inst. Of San Juan del Rio • Technological University of Qro (UTEQ) • Universidad Politecnica de Santa Rosa de Jauregui **International Institutions:** • West Virginia University • Clemson University USA • Universidad De Roma Tor Vergata, Italy • University of Nevada Reno	172 (WVU) 10 (UG) 77 (UAQ) 67 (ITQ) 31 (ITESM) 7 (CICATA) 11 (UTEQ) 10 (UPQ) 22 (Clemson) 8 (UTSJR) 8 (ITSJR) 17 (UNAQ) 1 (UNR) 5 (UPSRJ)	9 (WVU) 2 (UG) 5 (UAQ) 6 (ITQ) 4 (ITESM) 2 (CICATA) 2 (UTEQ) 1 (UPQ) 2 (Clemson) 2 (UTSJR) 2 (ITSJR) 2 (UNAQ) 1 (UPSRJ)	(2) GM (Gto) (4) TREMEC (Qro) (2) Transm-TSP (Qro) (1) Micro-Troq. (Qro) (3) IMT (Qro) (2) LAPEM (Gto) (2) I. Turbo Reactores (1) Terramite (WV) (3) KOSA (5) Case- New Holland (3) InMec (8) CENAM (2) ANSYS Mexico (1) Irving de Mexico (1) Crown Mexico (10) Mabe-GE Appliances (2) CIDEC-ConduMex (2) Arvin-Meritor (2) Gabriel (5) CIAT-GE Aircraft E. (3) VRK (Automotive) (2) CIATEQ (2) Bombardier (4) Messier Services (3) Brose (3) CIDEC-Delphi (2) CIDESI	GM Mexico (Silao) TREMEC Transmisiones-TSP Micro-Troquelados IMT* LAPEM* ITR (TurboReactores) Terramite Corp.** KOSA New Holland InMec CENAM* Group SSC (ANSYS) Irving- Composites Crown Mexico MABE CIDEC-ConduMex CIDEC-Delphi Arvin Meritor Gabriel CIAT-GE Aircraft E. VRK Automotive CIATEQ*(B. Quintana) Bombardier Messier Services CIDEC-Delphi BROSE CIDESI Construlita Grupo Mess * Research Centers ** From West Virginia	(1) GM Mexico (13) TREMEC (4) SPICER-TSP (1) Micro-Troq. (7) IMT (2) LAPEM (2) ITR Reactores (1) Terramite Corp.** (3) KOSA (12) Case-New Holland (1) InMec (15) CENAM (1) Irving- Composites (1) Crown Mexico (8) CIAT-GE (20) CIDEC-ConduMex (23) Mabe (2) Arvin Meritor (2) Gabriel (6) VRK Automotive (9) CIATEQ (5) Messier Serv. (4) Bombardier (4) CIDEC-Delphi (4) Brose (4) CIDESI (1) Construlita (1) Grupo Mess ** From West Virginia
17 Institutions	**446 Students**	**40 Faculty**	**80 Liaisons**	**30 Companies**	**157 Projects**

Join us in Queretaro, Summer 2019!

https://industrialoutreachmexico.wvu.edu


WEST VIRGINIA