

# INDUSTRIAL OUTREACH PROGRAM IN MEXICO

## Mini-Report 2019



**23 years bridging the gap between academia and industry and between Mexico and the USA...!!**



*Typical morning day at 7:30 am sharp...! Everybody ready to work...!!*

This Program aims at graduating highly competitive engineering graduates from Mexico and the USA, capable of working with professionals from different disciplines, 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 professional

practitioners from industry and faculty members from Mexico and USA universities. This is a full professional and cultural immersion that focuses on global engineering competencies and practical industrial experience while students earn credits towards their degrees.

***Join us this Summer 2020...!!!***

## Participating Institutions in the Summer 2019 Program

### Local Universities

Seven (7) local universities joined WVU in the summer 2019 Program. These institutions select several students in various engineering disciplines who are teamed up with WVU students and assigned to work on various industrial projects. In addition, more local students participate in a mathematics review course offered by a local university, in preparation for a placement test to become eligible for attending the Spring Semester at WVU as a visiting student. Students who qualify, are very competitive. The participating institutions for the 2019 cycle were:

- West Virginia University (WVU)
- Autonomous University of Queretaro (UAQ)
- Technology Institute of Queretaro (ITQ)
- Aeronautic University in Queretaro (UNAQ)
- Technological University of Queretaro (UTEQ)
- Tech. University of San Juan del Rio (UTSRJ)
- Polytech. Univ. of Sta. Rosa de Jauregui (UTSRJ)
- Polytech. University of Queretaro (UPQ)



### Companies and Centers

Every year, several local companies participate by offering a project to be conducted by a team of engineers from the companies and the students team assigned. The projects are always meaningful to the extent that the companies have engineers actively working on those projects. Typical assignments include design adaptations, system trouble shutting, or systems design for product development. Typically, projects have either an economic component or a market driven requirement, and invariably involve budget constraints and a strict timeline, to which student teams quickly adapt. This year the participating companies were:

- CIDECE – ConduMex – Wire and cables R&D
- CENAM – Metrology Center, R&D Standards Tech.
- CASE NEW HOLLAND – Agricultural machinery
- BROSE – German Automotive implements.



## Program Leaders



**Maestro 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.

## 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.
- To build personal and professional bridges into the future between USA and Mexican professionals, which transcend time as well as cultural and language barriers.
- To promote and create institutional ties between Mexican and USA universities and research centers.

## Housing and Logistics of Program

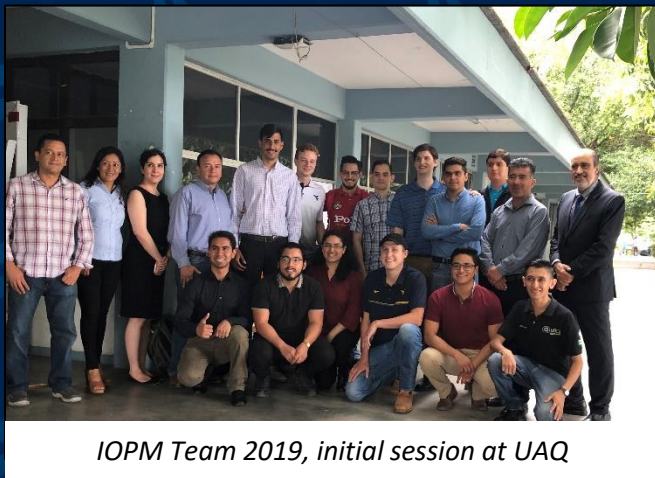


*Transport to and from neighborhood where students live*

Students are placed in homestay with local families in a well-established residential area of Queretaro (Col. Alamos 2a. Sec.) The families provide safe, healthy, comfortable and friendly environment for the students, who are always within walking distance to each other. 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 everyone rests.

## Mexican Students at WVU, Spring 2019



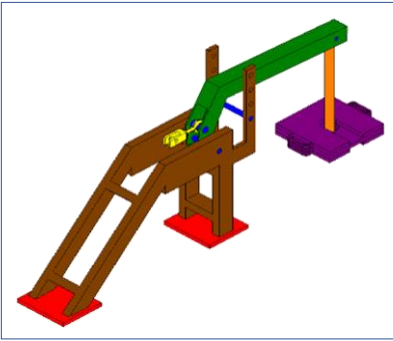
*IOPM Team 2019, initial session at UAQ*

Just like in the previous six 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 2019 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 (3<sup>rd</sup>/4<sup>th</sup> 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 four (4) students from WVU, who participated in the summer Program this year in Queretaro. Five (5) additional students from local universities joined the summer activity producing four (4) intermixed teams of three (3) to four (4) students per team, who worked on four (4) industrial sites. These projects are briefly described next.

## Project Descriptions, IOPM Summer 2019

- 1. Team CIDECON-ConduMex – The Creep Machine for Cables.** The objective of this project was to design a “cable creep testing machine,” capable of conducting a test verification of the creep (slow elongation) of commercial electric cables to satisfy electric norms for maximum permissible elongation under extended periods of tensile load.



The machine must operate in an environmentally control room and must maintain a constant tensile load on the cable while the cable elongates. The student team developed a mechanical design for the machine and a control system to monitor the tension on the machine. The current system was improved by reducing the risk to operators in the process of loading the machine and increased the reliability and repeatability of the tests through an integrated control system to reduce human error.



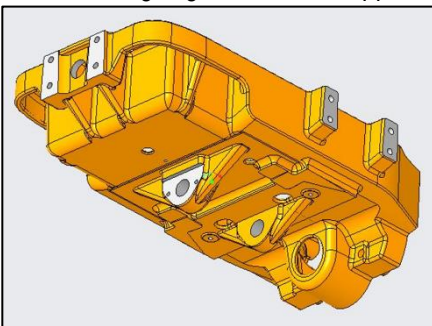
- 2. Team CENAM – The Solar Tree.** A solar tree is a structure that is meant to take advantage of renewable energy, while providing additional benefits when compared to traditional solar stations. The concept of a solar tree is to generate electricity



along with providing a shaded area. This area can be used as a charging station as well as a space that may include a vending machine powered by the tree. A solar tree utilizes many of the same concepts that solar stations use including optimal angles to gather sunlight to produce energy, but at the same time, it reduces the land surface required and adds an aesthetic value to the landscape. The objective of this project was to design a structure and electrical configuration for a solar tree that can generate up to 4 kW of energy, at standard testing conditions, while utilizing commercial solar panels. Structural and Electrical analysis were performed to verify and validate the design with experimental measurements on actual solar panels.



- 3. Team Case New Holland – Design of the Frontal Support for the 125 HP Tractor series.** This team was charged with designing a front-end support for a new agricultural tractor family in such a way that one casting could be adapted to different tractor versions. Redesign of a previous frontal support to be used in a new model of tractors Case New Holland is working on. Firstly, to make geometrical changes



to the support to remove unnecessary components and accommodate for new accessories in the tractor assembly to fit to the front support. Also reduce or keep the same mass. Then to perform finite element analysis on the front support using standards given to us

by the company, to determine the safety and reliability of the frontal support. Also, during the finite element analysis, the group is to run the simulation on two different materials and to see if one yields better results than the other.

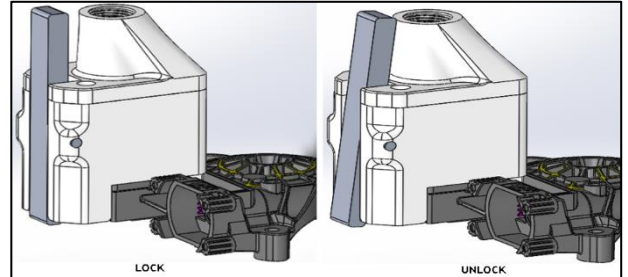


**4. Team Brose – Design of SBN Vibration Test on the BM2010 Motors.** Brose's Window Regulator Motors



are producing a great amount of scrap from its G05 motors which are produced for a German auto brand, due to excessive vibrations. 1.25% of motors have gone to scrap, which very costly to the company, which is aggravated by the fact that the time a defective motor is detected, it has already been assembled with other components (electronic circuit boards) in the system, making the scrap more costly. The team was able to

design a new testing device to simplify the task of identifying defective motors prior to assembling the circuit boards and thereby reducing the cost of scrap and a time effective way.



**Culture Class, Mexican Cultures, Summer 2019**

**FCLT 260 Cultures of Mexico Class.** An equivalent of this 3-credit course is taught by the Autonomous University of



*WVU-Queretaro Group visiting Teatro Hidalgo in*

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 "Siente-Iberica 2019" is another summer cultural event free of charge. The journey ends with a long weekend in Cancun and the Maya Riviera.



**Distinguished Visitors from WVU to Queretaro**



*Maestro Raul Iturralde, Director of CONCyTEQ, with Dr. Jacky Prucz, Chairman MAE, Ing. Gabby Jimenez of CONCyTEQ and Dr. Victor Mucino of WVU*

This year, the Chairman of the Mechanical and Aerospace Engineering at West Virginia University, Dr. Jacky Prucz visited the Program for few days in July. As an ambassador of good will and as a promoter and steadfast supporter of this Program, Dr. Jacky Prucz visited various centers, industries and universities during his stay. Dr. Prucz was able to see first-hand the

nature of the industrial projects for the students and was able to briefly chat with both Mexican and USA students. Dr. Prucz also visited some of the typical cultural sites in Queretaro, one where students spent a Saturday field trip.



*Dr. Elisabeth Sanchez, Dr. Lisa Prucz and Dr. Jacky Prucz from WVU visiting Bernal*



*Dr. Jacky Prucz visiting the Design-Build-Fly Lab at UNAQ*

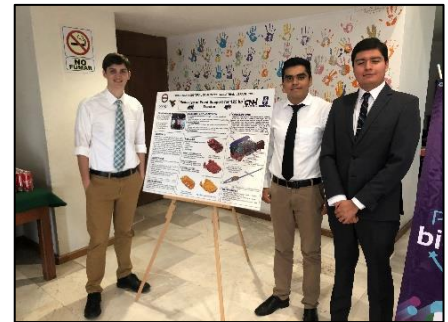


*Dr. Jacky Prucz visiting Airplane exhibit at (UNAQ) The |A| Arava 201 Airplane*

## Grand Finale with a Poster Session.



This year, CIDECONduMex hosted the Grand Finale Poster Session for all the teams of the Summer 2019. Attendants from participating universities, industries and from State Government agencies attended the final presentation of the CIDECONduMex Group, which was followed by the Poster Session. Several participating students choose to stay in the companies where they spent the summer to do a "follow up" on the project typically leading to a Senior Thesis or better yet, a job opportunity.



## 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.**

"Living and working in Mexico was one of the most enlightening experiences of my life so far. Being able to see the stuff you learn in class in the real world is such a rewarding experience and makes all those long nights in the library feel worth it. Learning about Mexican culture was so much fun and eating the food was even better. One of the biggest regrets of my college career would have been not going on this trip." **Christian Krause, MAE Summer 2019.**

I will say the trip was arguably the best decision of my life. Not only did I make new friends, get some courses out of the way, I learned so much about a culture, and the trip landed me a job. I recently accepted a job with EATON. During my interviews, the main difference about me was that I spent a summer working in Mexico. This shows a company that you are not afraid to take risks, that you can adapt to uncomfortable situations, that you can work with people that do not share everything in common with you. These are extremely valuable traits and often difficult to portray to a company. **Dennis Farabaugh, Summer 2019.**





## IOPM 23-YEAR SUMMARY OF ACTIVITY

Institutions Involved	Students	Faculty	Industrial Liaisons	Industries Sites	Projects developed
<b>Local Institutions:</b> <ul style="list-style-type: none"> <li>• CONCyTEQ</li> <li>• University of Guanajuato</li> <li>• University of Queretaro (UAQ)</li> <li>• Institute of Technology of Queretaro (ITQ)</li> <li>• Tech. University of San Juan del Rio.</li> <li>• ITESM (Tec. De Monterrey)</li> <li>• CICATA (IPN)</li> <li>• Aeronautical University in Querétaro (UNAQ)</li> <li>• Polytechnical Univ. of Queretaro (UPQ)</li> <li>• UNAM</li> <li>• Tech. Inst. Of San Juan del Rio</li> <li>• Technological University of Qro (UTEQ)</li> <li>• Universidad Politecnica de Jauregui</li> </ul>	176 (WVU) 10 (UG) 80 (UAQ) 68 (ITQ) 31 (ITESM) 7 (CICATA) 12 (UTEQ) 11 (UPQ) 22 (Clemson) 9 (UTSJR) 8 (ITSJR) 18 (UNAQ) 1 (UNR) 6 (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) Transmisiones-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 México (1) Irving de México (1) Crown México (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 México (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	(1) GM Mexico (13) TREMEC (4) SPICER-TSP (1) Micro-Troq. (7) IMT (2) LAPEM (2) ITR Reactores (1) Terramite Corp.** (3) KOSA (13) Case-New Holland (1) InMec (16) CENAM (1) Irving-Composites (1) Crown Mexico (8) CIAT-GE (21) CIDEC-ConduMex (23) Mabe (2) Arvin Meritor (2) Gabriel (6) VRK Automotive (9) CIATEQ (5) Messier Serv. (4) Bombardier (4) CIDEC-Delphi (5) Brose (4) CIDESI (1) Construlita (1) Grupo Mess
<b>International Institutions:</b> <ul style="list-style-type: none"> <li>• West Virginia University</li> <li>• Clemson University USA</li> <li>• Universidad De Roma Tor Vergata, Italy</li> <li>• University of Nevada Reno</li> </ul>				* Research Centers ** From West Virginia	
<b>17 Institutions</b>	<b>459 Students</b>	<b>40 Faculty</b>	<b>80 Liaisons</b>	<b>30 Companies</b>	<b>161 Projects</b>

<https://industrialoutreachmexico.wvu.edu>

# Join us in Queretaro, Summer 2020...!

