This year, Dr. Victor Mucino took 12 WVU students to team up with 13 Mexican students in the Industrial Outreach Program in Mexico. This is an “Extended Learning” Program the Department of Mechanical and Aerospace Engineering (MAE) has developed in coordination with the Council for Science and Technology of the State of Queretaro (CONCyTEQ) in Mexico. During six weeks in the summer, WVU senior engineering students team up with Mexican engineering students from various universities in Queretaro and form intermixed working groups. Each group is assigned to work at an industrial site on engineering problems, which are the tackled working alongside with engineers from industry. The environment is a professional one but with the added dimension of a cultural and a language immersion, which brings about cultures and personalities from the two countries, five institutions and as many industries involved.

Objectives of the Program

The objective of this program is first and foremost, to add value to engineering education and to produce top quality engineering graduates, by providing a meaningful industrial exposure in a multicultural and multilingual professional environment. The program also seeks to bring value to industry through the projects assigned to the participating students, who develop practical engineering skills as well as communication, leadership and human-relations skills.

Finally, this program seeks to bring faculty and engineers from industry to share expertise in formulating and solving engineering problems.

By teaming up with Mexican students, WVU students acquire a cultural exposure that is reciprocated to the Mexican students. The mix of professional environment with a different culture provides a framework that brings
Industrial Outreach Program in Mexico: A Professional and Cultural Immersion

Students learn and fine-tune their engineering skills while they hone their communication and interpersonal skills. At the end of the six-week exercise, students give a professional presentation to the sponsored industries using the Spanish that they learn while working with Mexican professionals, while Mexican students deliver their presentation in English they learn with the help of our students. This is a character-building exercise that brings the cultures and personalities to the forefront of the projects. Students live with local families who provide a home away from home environment for a total cultural immersion.

Description of Sample Projects

This year 9 different projects were conducted with 6 different companies, such as CIAT (General-Electric Air-Craft Engines), Arvin-Meritor, Condumex-Gabriel, MABE (General-Electric Appliances), Tremec and CENAM (Mexico’s NIST). The projects ranged from design assessment and trouble shutting to industrial design process analysis and development, including fieldwork, engineering design and system modeling and analysis.

Project at MABE (GE-Appliances)

Two different projects were undertaken at MABE. The first involved the design, analysis and testing of components for domestic appliances. Finite element modeling of these systems was made to design specific components. The student team developed alternate designs, which were also modeled, analyzed and scrutinized by Mabe’s engineers.

The second project was designing a test rig that was capable of obtaining the Q value of various heat exchangers. The test rig was designed to accommodate any size and type of HX used at Mabe for application in refrigerators.

Project at CONDUMEX-Gabriel

The student team was assigned to proposed improvements in the design of an automotive strut. Various perspectives were considered including strength characteristics and manufacturing considerations.

Project at CENAM (Mexico’s NIST)

The project at CENAM involved the experimental study on friction stir welding. The objectives of this group was to determine the parameters of the FSW process, perform tests with friction-stir-spot-welding, and friction-stir-linear-welding, and obtain as many results from the welding process as possible.
Project at Arvin-Meritor
Arvin Meritor is a worldwide supplier of integrated systems, modules, and components for light vehicles, commercial trucks, trailers, and specialty OEMs and related aftermarkets. The operation based in Queretaro, Mexico specializes in producing struts, suspension systems, and exhausts. The plant operates in an assembly line and time and production are highly valued. This group analyzed an existing machine and designed new parts in order to reduce scrap and increase production. Also, a cost analysis of the stations was done in order to provide the company with a clearer outlook of the process.

Project at CIAT (GE-Aircraft Engines)
Two projects were performed at CIAT; the first involved the heat transfer phenomenon that occurs with the aircraft engine systems. The second consisted of analyzing the mechanical response of some aircraft engine components. Students developed predictive models based on experimental data as well as finite element models to assess engine/part performance.

Tremec
The main objective of this project was to help TREMEC model a new design of two different CVT’s (continuously variable transmission). Specifically, the objective was to describe the power recirculation flow and the power-split features of the system. A prototype was used for the modeling and analyses performed.

9 Year Summary
In nine years, this program has impacted more than 120 students in Mexico and WVU, through over 40 industrial projects, worked with 6 institutions in Mexico, and about 20 different industries. The summary table below provides a quick reference on the impact of this program.
**Cultural Highlights**

Cultural opportunities are plentiful throughout the six weeks. From archeological sightseeing to horse back riding outings to golden sunset in Acapulco in the company of Mexican students.

Host families also provide a major cultural opportunity, as they provide a “home away from home” environment, clean and safe environment along with some kind of an “extended family” feeling. Students learn about Mexican food, Spanish, traditions and participate fully on social activities with the friendly local people of Queretaro.

**Conclusion**

Our Program is unique. It pursues the main objective of adding value to engineering education through an industrial exercise in an international setting. The program addresses issues that range from communication skills and cultural differences to human relations in the context of a practical engineering project. This experience has brought forward not only the practical engineering dimension, but also the human dimension that comes with the territory.

Indeed, cultural differences actually exist. They come forward when people disagree, when people negotiate and when people reach agreements. Those differences are inherent in the concept of “value” as well as in attitudes toward life. But being able to understand and better yet, anticipate cultural differences may be the difference between failure and success in professional situations in today's industry. In an increasingly globalized professional environment, we are doing our share to meet the challenge.
Institutions Involved | Participant students | Faculty from both countries | Industrial Liaisons | Industries/Research Centers | Projects developed |
---|---|---|---|---|---|
- West Virginia University  
- University of Guanajuato  
- University of Queretaro  
- Institute of Technology of Queretaro  
- CONCyTEQ Queretaro  
- ITESM (Tec. De Monterrey)  
- UNAM  
  83 (WVU)  
  10 (UG)  
  36 (UAQ)  
  31 (ITQ)  
  3 (WVU)  
  2 (UG)  
  4 (UAQ)  
  4 (ITQ)  
  2 (ITESM)  
  (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  
  (3) New Holland  
  (1) InMec  
  (1) CENAM  
  (2) ANSYS Mexico  
  (1) Irving de Mexico  
  (1) Crown Mexico  
  (2) Arvin-Meritor  
  (2) Gabriel  
  (3) Mabe-GE Appliances  
  (2) ConduMex  
  (4) CIAT-GE Aircraft E.  
  GM  
  TREMEC  
  Transm-TSP  
  Micro-Troquelados  
  IMT*  
  LAPEM*  
  I. Turbo Reactores  
  Terramite Corp.**  
  KOSA  
  New Holland  
  InMec  
  CENAM  
  Grupo SSC (ANSYS)  
  Irving- Composites  
  Crown Mexico  
  Mabe  
  ConduMex  
  Arvin Meritor  
  CIAT-GE Aircraft E.  
  * Research Centers  
  ** From West Virginia  
  (1) GM Mexico  
  (8) TREMEC  
  (4) SPICER-TSP  
  (1) Micro-Troq.  
  (4) IMT  
  (2) LAPEM  
  (2) I. Turbo Reactores  
  Terramite Corp.**  
  (1) Irving  
  (1) Crown  
  (4) CIAT  
  (2) ConduMex  
  (4) Mabe  
  (2) Arvin Meritor  
  (2) Gabriel  
  (1) GM Mexico  
  (8) TREMEC  
  (4) SPICER-TSP  
  (1) Micro-Troq.  
  (4) IMT  
  (2) LAPEM  
  (2) I. Turbo Reactores  
  Terramite Corp.**  
  (1) Irving  
  (1) Crown  
  (4) CIAT  
  (2) ConduMex  
  (4) Mabe  
  (2) Arvin Meritor  
  (2) Gabriel  
  ** From West Virginia  

7 Institutions  
150 Students  
15 Faculty  
42 Liaisons  
20 Companies  
49 Projects

Nine-year summary table of people, companies and projects developed in this Program.

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