Attributes of a Global Engineer

Tecnologico de Monterrey
Global Engineering Education

From Wikipedia, the free encyclopedia

Definitions

Global Engineer

What is a global engineer? There is not one consistent view or definition.

Global Engineering Attributes

What are some of the attributes that one should have to be a global engineer?
Proposed Desired Attributes of a Global Engineer Draft 9-09

Engineering Science Fundamentals

- Mathematics
- Physical and Life Sciences
- Political and socio-economic sciences
- Information Technology
  - Digital Competency, Internet collaboration tools, Graphics/Design drawings, charts & graphs, presentation, and basic brochure design, Security requirements & information protection, ITAR/EAR regulations, Intellectual Property laws

Engineering

- Understand Design and Product Processes
- Understanding of Product life cycle development and management
- Effective Teamwork/Common Goals
- Possess a Multi-Disciplinary, Systems Perspective
- Maintain Focus with Multiple Project Assignments

Business Acumen

- Economics/Finances of Projects
- Supplier Management principles
- Customer and Societal Emotions and needs
- Cultures, Languages, & Business Norms
- Societal, Economic, & Environmental Impacts of Engineering Decisions
- An International/Global Perspective
- Risk Management
- Continuous improvement
- Project Managements
- Teamwork/Common goal setting

Context in which Engineering is practiced

- Economics/Finances of Projects
- Basic Supplier Management principles
- Customer and Societal Emotions and needs
- Cultures, Languages, and Business Norms
- Societal, Economic, and Environmental Impacts of Engineering Decisions
- An International/Global Perspective

*Attributes defined by ASEE Corporate Membership Council, SIG on Global Engineering Education
Proposed Desired Attributes of a Global Engineer Draft 9-09

**Communication**
- Written (Memos, reports, email, letters, etc.)
- Verbal (Technical & non-technical presentations plus an effective “elevator” speech.)
- Foreign language—Technically fluent in at least two languages, acknowledging English is considered a key global language.
- Graphics (see above)
- Digital Competency (see definition and notes)
- Competent at Internet collaboration and communication tools (web-based meeting tools; team rooms, teleconferencing; file sharing, E-mail etc.)

**Teamworks**
- Active and Effective Participation in Team Efforts
- A Willingness to Respect the Opinions of Others and Support Team Decisions

**Leadership**
- Displays an Acceptable Personal Image and Projects a Positive Personal Attitude
- Treats People with Fairness, Trust, and Respect
- Respect for diversity: demonstrate courtesy and respect, eager to help others

**Commitment to Quality, Timeliness, and Continuous Improvement**
- Understands basic project and risk management and continuous improvement Concepts (like LEAN+)

**Ethical Standards and Professionalism**
- Operates in Accordance With Acceptable Business, Societal, and Professional Norms
- Maintains the Highest Level of Integrity, Ethical Behavior, and Professional Competence
- Understands and Applies Good Personal Judgment
- Curiosity & desire for life long learning
- Desirable business, societal, and professional norms
- Self-Confidence to Adapt to Rapid/Continuous/Major Change
- Thinks Both Critically and Creatively – Independently and Cooperatively.
Tec de Monterrey

- Founded in 1943
- 33 campus
  - 65,000 (undergraduate + graduate)
  - 31,000 (Sr. High School)
- Private, non-profit
- 50% of students with scholarship or loan
- Incubators
- Technology Parks (8)
- Virtual University
  - Distance learning programs
    - 8,380 graduate students
    - 99,085 corporate continuing education
    - 143,172 social programs
Monterrey Campus

San Luis Potosí Campus
Mexico

- Population: 106.8 million
- GDP $1,005 billion USD.
- GDP per capita $9,458
- Population living in poverty 40%
- Economically active population: 59.31%
- Unemployment rate: 5.43%
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<th>Age</th>
<th>Net Worth</th>
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Other Mexican Billionaires:
- Ricardo Salinas Pliego $10.1 (63)
- Germán Larrea Mota $9.7 (72)
- Alberto Baillères $8.3 (82)
- Jerónimo Arango $4.0 (212)
- Emilio Azcárraga Jean $1.5 (655)
- Roberto Hernández Ramírez $1.2 (82€)
Mexico’s Challenges

• Reduce \textit{poverty}

• Create \textit{Jobs}

• Guarantee \textit{security} of individuals and organizations

• Improve \textit{quality of education} (all levels)

• Foster \textit{innovation}, evolve into a \textit{knowledge-based economy}
Higher Education in Mexico

- **2,150,146** Total undergraduate enrollment
- **1,300+** Universities
- **~70,000** Eng. students graduate every year

- **718,668** Enrollment in non Engineering Programs (33%)
- **1,431,478** Enrollment in Engineering Programs (67%)
Global Engineering @Tec de Monterrey

- Competency in the Discipline
- Global Perspective
- Leadership
- Teamwork
- Communication Skills
- Ethics, Citizenship
- Entrepreneurship & Innovation
Competency in the Discipline

• Curricula compliant with international society recommendations
  - IEEE
  - SAE
  - ASME
  - AIS
  - ACM

• Pursue Accreditations
  - National - CACEI, CONAIC
  - International – ABET

• How we teach
  - Active Learning: Problem Based Learning, Collaborative work, Project Oriented Learning
  - State of the art tools/techniques
  - Capstone projects
  - Co-op experiences
Global Perspective

• ~50% of the students participate in study abroad programs

• Proficiency in 2nd language is a requirement for graduation (English - TOEFL 550)

• Some students graduate with proficiency in a 3rd language: German or French.

• Student Chapters of International Associations
Global Perspective

“I liked a lot the opportunity to interact with people from a different culture. BMW was like a small city... my work there was in the area of design.”

Marco Mascorro, Mechatronics

BMW, FH Offenburg, Alemania
Global Perspective

Arizona State University  
Baylor University  
California State University at Sacramento  
Carnegie Mellon University  
Clemson University  
Colorado School of Mines  
Columbia University  
Cornell University  
East Carolina University  
Embry Riddle Aeronautical University  
Georgia Institute of Technology  
Iowa State University  
Kansas State University  
Michigan State University  
Michigan Technological University  
Mississippi State University  
Missouri University of Science and Technology  
New Mexico State University  
North Carolina State University – Raleigh  
North Dakota State University  
Northeastern University  
Northwest Missouri State University  
Ohio State University  
Oregon Institute of Technology  
Oregon State University  
Pennsylvania State University  
Polytechnic University of New York  
Purdue University  
Syracuse University  
Texas A&M University  
The University of Arizona  
University at Albany - State University of New York  
University at Buffalo - The State University of New York  
University of Illinois at Urbana Champaign  
University of Miami  
University of Michigan  
University of North Carolina at Chapel Hill  
University of North Carolina at Charlotte  
University of North Carolina at Greensboro  
University of Pittsburgh  
University of Rhode Island  
University of Texas at Austin  
University of Washington  
University of Wisconsin  
Utah State University  
Western Illinois University  
University of New Mexico  
Wichita State University  
Kettering University  
Illinois State University  
Ohio Northern University  
San Diego State University  
San Francisco State University  
San Jose State University  
Southeast Missouri State University  
University of Cincinnati  
University of Wisconsin-River Falls  
Western Kentucky University  
Boise State University  
California State University at Chico  
East Carolina University - Internship Program  

And more....
Global Collaborative Engineering Course

- Virginia Tech, USA
- Technische Universität Darmstadt, Germany
- Howard University, USA
- Shangai Jiaotong University, China
- Tec de Monterrey, Mexico
Broad Education

Programs are 4.5 yrs

15%-20% of curriculum covers the following areas:

- Ethical responsibility
- Citizenship
- Knowledge of contemporary issues
- Impact of engineering in a global and social context
- Communication skills

Starting “across the curriculum” approach.
Social Responsibility

Shampoo *Amolí artesanal*, Paso Bonito Ahualulco community

**What did the students do?**

- Standardization of production process
- Quality & consistency tests
- Feasibility study
- Contact with suppliers
- Contact with government agencies
Leadership

• 40% of students participate in
  – Student associations
  – Special programs to promote leadership skills:
    • Prolider workshop, “Eagles” Boot Camp.
  – Organization of congress/symposiums
  – Sport teams/cultural groups
Entreprenurship & Innovation

Digital Communication (IP) in rural areas
Daniel Coronado, Computer Science & Eng.

Water processing plant for domestic use
Joel Olguín, Mechatronics
Technology Parks

International Companies

Local Companies (Technology Based)
Evaluate & Improve

- Global Perspective
- Communications skills
- Environmental Awareness
- Self-confidence
- Leadership
- Entrepreneurship & Innovation
- Citizenship
- Ethics

Evaluate & Improve
Muchas gracias

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