Global Engineering: Description of Course Unit Seminários 2015/2016 - 1S

Teaching Language

English

Objectives

Development of a prospective vision of engineering: Global Engineering.

Collaboration between students, faculty, and guest lecturers at Faculdade de Engenharia da Universidade do Porto (FEUP) in Portugal and the University of Maryland Baltimore County (UMBC) in the U.S. Development of students' global competencies and skills important for the "Renaissance Engineers of the 21st Century." These are skills that, traditionally, receive little attention in engineering curricula.

Global Engineering will establish an interdisciplinary study of engineering technology, entrepreneurship, and the influence of global society and culture on problem-solving. The course will use explicit technological examples to explore how different cultures meet the engineering objective (both their paths and final solutions may differ). Topics will include the global scope of engineering; differences in engineering around the world; cultural, environmental, and political factors; conducting oneself in a foreign environment; and preparing for an international work/study experience. Guest speakers will present lessons learned in real global engineering cases, where both technical and cultural factors are integral. Students will build on these cases by practicing the appropriate application of engineering resources in diverse scenarios. The students at UMBC and FEUP will form multi-cultural teams to design and present their engineering solutions. By working remotely with colleagues at a foreign university, students will gain direct experience in cross-cultural collaboration, including joint research, writing, and PowerPoint presentations.

Global Engineering will utilize a transparent teaching style. This means clearly defining terms and expectations, making deliverables clear, and explaining how they will be evaluated. Yet it also involves discussing with students why they are learning and executing certain procedures and how these translate to real-world applications. Global Engineering is not only the course topic but its *modus operandi*. As such, it will model self-reflection and clear communication. The course will give students an authentic global work experience *and* a forum for discussing how to navigate its challenges, thereby offering a unique preparation for 21st-century engineering.

Learning outcomes and competences

- Students' leadership and collaborative skills improved;
- Increased consciousness and knowledge of how to create teams that operate successfully;
- Entrepreneurship skills developed;
- Communication skills improved;
- Self- and hetero- evaluation skills strongly developed;
- Students' awareness and knowledge on sustainability and environmental problems increased;
- Students' sensitivity to social inclusion and 'design for all' (aged and young, able and disabled people) increased;

- They will be able to identify, evaluate, and formulate complex problems, with scientific, technical and human components; they will become able to establish the bases of practical solution to real problems, at different levels and scales; they will know and comprehend the importance of engineering and other professions to reshape the world for human beings.

Working method

Presentations, discussion, individual assignments, and team projects

Programme

- Discussion with students about the characteristics of a Global Engineer; reflection on their own strengths, weakness and needs to become future engineers.
- Review of engineering techniques and challenges
- Production and presentation of work projects, as well as peer review of other teams; discussion of effective communication and critique.
- Presentations by specialists—faculty, researchers, industry professionals—with great experience in practical applications of engineering in a global context.

Main Bibliography

- *Educating The Engineer of 2020: Adapting Engineering Education to the New Century*. National Academy of Engineering. Washington, D.C.: The National Academies Press, 2005.
- *Entrepreneurship for Engineers*. CRC Press, 2010
- *Teaching and Training for Global Engineering: Perspectives on Culture and Professional Communication Practices*. Ed. Kirk St. Amant and Madelyn Flammia. Piscataway: IEEE Press, 2016.

Complementary Bibliography

- Collier, Paul. *The Bottom Billion: Why the Poorest Countries are Failing and What can be done About it*. Oxford: OUP, 2008.
- Legg, Gary. *American Engineers in Japan: Same Profession, Different Worlds*, 1989.
- Mor Barak, Michalle E. *Managing Diversity: Toward a Globally Inclusive Workplace*. Sage Publications, Inc, 2005.
- Morice, P.B. *Britain and European Engineering Education*, 1988.
- Wiley. *Global Engineering and Construction* Wiley, 2006

Teaching methods and learning activities

Common lectures between FEUP and UMBC using video conference system.

Multicultural team projects, individual assignments, analysis and debate, and presentations by subject matter experts.

Student-evaluation of team projects and course evaluation for continuous improvement.

Type of assessment

Distributed evaluation without final exam

Assessment Components

Designation	Weight (%)
Homework/ Questions	20,00
Individual work	20,00
Group projects	60,00
Total:	100,00

Eligibility for exams

According to the rules of the faculty.

Calculation formula of final grade

Rubrics for project-based learning are developed and will be extensively used in this course to document and evaluate performance. All work will be utilized in evaluation in light of the listed aims of the course, namely teamwork and other enabling skills, observation, critical thinking, awareness, sensitivity, technology, scientific merit, etc.

Grading will follow the scoring of
Percentage ≥ 90 = A (equivalent in Portugal: 19)
$90 >$ Percentage ≥ 80 = B (equivalent in Portugal: 17)
$80 >$ Percentage ≥ 70 = C (equivalent in Portugal: 14)
$70 >$ Percentage ≥ 60 = D (equivalent in Portugal: 12)
Percentage ≤ 60 = F(equivalent in Portugal: 08)

Special Assignments

To be defined in each case, if necessary.

Special evaluation (TE, DA, ...)

According to Faculty rules.

Improvement of Final/Distributed Grade

Through the improvement of teamwork and a second presentation.