UMBC UGC New Course Request: ENME417 Global Engineering

Date Submitted: **10-1-18, revised 7-9-19** Proposed Effective Date: **Fall, 2019**

	Name	Email	Phone	Dept
Dept Chair or UPD	Dr. Ruey-Hung Chen	chenrh@umbc.edu	5-3313	ME
Other Contact	Dr. Marc Zupan	mzupan@umbc.edu	5-6822	ME

COURSE INFORMATION:

Course Number(s)	ENME417
Formal Title	Global Engineering
Transcript Title (≤30c)	Global Engineering
Recommended Course Preparation	
Prerequisite **NOTE:** Unless otherwise indicated, a prerequisite is assumed to be passed with a "D" or better.	You must have completed all 300-level ENME courses with a grade of "C" or better and have senior standing with a 2.0 or better GPA.
# of Credits Must adhere to the UMBC Credit Hour Policy	3
Repeatable for additional credit?	☐ Yes ☒ No
Max. Total Credits	3 This should be equal to the number of credits for courses that cannot be repeated for credit. For courses that may be repeated for credit, enter the maximum total number of credits a student can receive from this course. E.g., enter 6 credits for a 3 credit course that may be taken a second time for credit, but not for a third time. Please note that this does NOT refer to how many times a class may be retaken for a higher grade.
Grading Method(s)	☒ Reg (A-F) ☐ Audit ☐ Pass-Fail

PROPOSED CATALOG DESCRIPTION (Approximately 75 words in length. Please use full sentences.):

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. This course includes material that supports the development of an entrepreneurial mindset and skillset.

RATIONALE FOR NEW COURSE:

See attached document

ATTACH COURSE SYLLABUS (mandatory):

Rationale: Please explain the following:
a) Why is there a need for this course at this time?

The UMBC campus is undergoing an internationalization as a member of the ACE Internationalization Laboratory. This campus-wide internationalization effort is ongoing with the campus self-study and planning occurring. Internationalization will be a primary theme for the campus retreat, setting the stage for the implementation of the international plan. As subcomponent of the internationalization is Curriculum, Co-curriculum, and Learning Outcomes (a sub-committee which is co-chaired by Zupan). The committee is addressing campus-wide questions of Global Student Learning Outcomes, Global Course Content and Pedagogy, Global Academic Policies and Requirements, Co-curriculum and Student Interest in Global Learning. This course is salient to these efforts and acts as an existing hallmark for current and future globalization on our campus.

Focused on engineering (although the course is not limited to engineering students) more than ever before, engineering is a global endeavor. Next generation engineers must have skills to work in globally dispersed heterogeneous teams operating in different physical locations, possibly in different time zones and with cultural perspectives. This program not only addresses the educational component of training engineers with much needed global skill; it addresses the pragmatic hurdles that not all students have the fiscal or time means to spend time abroad. This at home based global learning provides an inclusive path for students to develop international skills.

b) How often is the course likely to be taught?

Every Fall

c) How does this course fit into your department's curriculum?

It is a technical design elective and is part of the Entrepreneurship minor elective course. Moreover, the course fills part of the Global component of the UMBC National Academy of Engineering Grand Challenges Scholars program.

d) What primary student population will the course serve?

Third and fourth-year students. It is open to all majors.

e) Why is the course offered at the level (i.e., 100, 200, 300, or 400 level) chosen?

It is an upper-level elective. The course number designation is used to align the course with our global partners in Portugal and now being expanded to Colombia.

f) Explain the appropriateness of the recommended course preparation(s) and prerequisite(s).

Upper-level 3rd or 4th-year students.
g) Explain the reasoning behind the P/F or regular grading method.

The course uses regular grading methods. The course is based on intensive group-based learning and requires alignment with partner university grading schemes. The course utilizes a transparent teaching style. This involves giving students explicit guidelines and directives – clearly defining terms and expectations, making deliverables clear, and explaining how they are evaluated. It also involves discussing with students why they are learning and executing certain procedures and how these translate to real-world engineering pursuits.

The course uses a pedagogy that is practical, informative, and self-reflective.
Practical: students are assigned to write peer reviews for their counterparts (to gain familiarity with this genre on an international front) and simulate the process of defining equipment needs and purchasing material from a foreign country.
Informative: Students are encouraged to design ideas, research techniques, and delivery methods from different engineering cultures.
Self-Reflective/Meta-Reflective: Students openly discuss how to adapt to the challenges of creating integrative solutions in a different country, language, culture, and infrastructure. With Zupan as their instructor, the Portuguese and Colombia students can share how they adapt to the teaching style of an American professor, to education in a foreign language, and to the experience of collaborating with student-partners from a different country. Essentially, Zupan serves – self-reflexively – as a model for his students in navigating the challenges, struggles, and triumphs of international partnership in engineering research and education.

This foundational course is designed to be transparent about the unique obstacles and unparalleled advantages of global engineering. With this open pedagogical approach, students have the experience of jointly working with peers from a different culture of engineering, but also have an open forum for discussing the dynamics of such cooperative work. In so doing, students can cultivate cultural awareness and strategic problem-solving skills and learn to open communication paths that are crucial for the teamwork necessary for success in any engineering profession.

h) Provide a justification for the repeatability of the course.

The course has been expanded to include multiple sections that are completely full ad have students on the wait lists. Students have a strong desire to take this course, and it is oversubscribed. For Fall 2019 two sections of the course are offered, both are full, and both have a wait list (The same can be said about the Fall 2018 offering). As part of the Entrepreneurship minor, the UMBC National Academy of Engineering Grand Challenges Scholars program and the campus-wide internationalization this at global at home course is desirable to students.

ENME 417 Global Engineering: Description of Course Unit Seminários

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.

ENME 417 Global Engineering: Description of Course Unit Seminários

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.