

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	POST GRADUATE STUDIES		
COURSE CODE		SEMESTER	1st SEMESTER
COURSE TITLE	Climate System and Climate Change		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	7
Laboratory Exercises		1	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>		5	
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Specialized General Knowledge		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	<i>Under Construction</i>		

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

A circular economy makes use of various strategies such as reducing, reusing and recycling that together eliminate waste, lower material and resource consumption and reduce greenhouse gas emissions. There is a significant link between the circular economy and climate change. The transitioning to a circular economy can arguably mitigate greenhouse gasses and carbon dioxide emissions that emerge from extractive industries, manufacturing, construction, transportation and other sectors.

Climate change adaptation can also be circular. In the context of cities, urban planning, electromobility, circular waste management, trees and green areas, reducing emissions of gaseous pollutants, etc, offer great opportunities for both circularity and adaptation.

Some of the basic pillars of the circular economy are human health and wellbeing, society and culture, biodiversity, materials, energy and water. In this frame, the course of “Climate System and Climate Change” will offer to the students the opportunity to access the knowledge of climate systems and climate change impact on circular economy and more specifically, the impact of climate change on the basic pillars of circular economy.

The impact of climate change and its effects on the global climate systems, the role of climate change on land use and generally the role of climate change in shaping the global climate systems, as well as the process of weather and biometeorological conditions prognosis are integral parts of this course.

Upon completion of the course, students will be able to:

- be expected to understand the concept of climate systems and climate change,
- are driven to analyze the scenarios and dynamic interactions between climate systems and finally to know the reset policies,
- are encouraged to investigate, understand, analyze, decompose and finally synthesize each of the potential impacts of climate change on each one of circular economy pillars,
- are able to perceive, interpret and clearly explain issues related to climate change, to generalize the problem, to correctly appreciate in order to make right conclusions,
- are able to use all the concepts related to climate change and climate systems, to provide new calculations, to be able to correctly classify the causes of the various problems and generate new knowledge, while gaining implementation experience.
- are able to revise old views related to climate change and its treatment, so they can create new knowledge. Also, be able to compose and organize working groups and propose solutions.
- are able to participate in measuring-experimental procedures. Be able to know to handle suitable measuring devices and also to be able to evaluate the measurement results in order to judge situations correctly, proposing in each case the appropriate solution.
- are able to work with their fellow students, to create and present both at individual and group level a case study from its initial stages up to the final evaluation and finally to be able to propose new ideas and solutions.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking

Others...

More specifically, students will be able to:

1. Search, analyze and synthesize appropriate data and information using and applying the required technologies
2. Have the necessary skills for best and efficient Decision Making
3. Have the ability to plan, direct and complete Individual projects
4. Have the appropriate character and ability for teamwork and collaboration
5. Propose new research ideas
6. Respect nature and human wellbeing in the frame of Climate Systems
7. Showing social, professional and ethical responsibility concerning circular economy and Climate systems

The core modules of the course include:

Chapter 1: Introduction to the Climate System & Climate System Components

Chapter 2: Natural and Human-induced Climate Variations

Chapter 3: Urban Climate and Climate Change

Chapter 4: Biometeorology and Microclimate-Human thermal comfort and wellbeing

Chapter 5: Modelling the Climate System and Climate Change

Chapter 6: International Policy on Climate Change

Chapter 7: The Impact of Climate Change on Society and Culture in the Frame of Circular Economy

Chapter 8: The Impact of Climate Change on extreme weather events in the Frame of Circular Economy

Chapter 9: The Impact of Climate Change on biodiversity in the Frame of Circular Economy

Chapter 10: Air Pollution Impact on Climate Change and Circular Economy

Chapter 11: Transportation and Urban Mobility. The Contribution of Electromobility on Climate Change and Circular Economy

Chapter 12: Prognosis and Optimization of Environmental Quality with the application of Artificial Neural Networks. Prediction of Atmospheric Environment quality and adverse effects on Circular Economy

(4) TEACHING and LEARNING METHODS - EVALUATION

<p>DELIVERY <i>Face-to-face, Distance learning, etc.</i></p>	Lectures and Lab. exercises, in person and online	
<p>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	Teaching using ICT, Laboratory Education using ICT and experimental devices, Communication and Electronic Submission	
<p>TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p>	Activity	Semester workload
	Lectures	52
	Laboratory Exercises	13
	Personal study	91
	Course total	156
<p>STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<ul style="list-style-type: none"> ➤ Intermediate assessment and written final examination. ➤ Concerning the Laboratory of the course, individual and/or team assignments and written or oral examination or presentation, per exercise and per study case. 	

(5) ATTACHED BIBLIOGRAPHY

1. The Global Climate System: Patterns, Processes, and Teleconnections. Howard A. Bridgman, John E. Oliver. Cambridge University Press, 2006. Online ISBN: 9780511817984. DOI: <https://doi.org/10.1017/CBO9780511817984>
2. The Climate System. Edited By: J Berdowski, R Guicherit and BJ Heij. Publisher: A A Balkema, 2001. ISBN: 9789058092557
3. Global Climate: Current Research and Uncertainties in the Climate System. Xavier Rodo, Francisco A Comín, Springer Science & Business Media, 2002. ISBN 3-540-43820-3
4. The Politics of Climate Change. Anthony Giddens, 2011. Publisher: Polity Press. ISBN: 9780745655154.
5. Climate Change, Human Impact and Green Energy Transformation. GeoPlanet: Earth and Planetary Sciences. Jan Kiciński, Patryk Chaja, Publisher: Springer Nature, 2021, ISBN: 3030699331, 9783030699338.
6. Climate Change: Global Risks, Challenges and Decisions. Katherine Richardson, Will Steffen, Diana Liverman. Publisher: Cambridge University Press, 2011. ISBN: 1139496204, 9781139496209.
7. Reconfiguring the Global Governance of Climate Change, Global Governance. John J. Kirton, Ella Kokotsis, Brittaney Warren. Publisher: Routledge, 2022. ISBN: 0429619286, 9780429619281.
8. Adopting Circular Economy Current Practices and Future Perspectives. Special Issue Editor, Idiano D'Adamo. Printed Edition of the Special Issue Published in Social Sciences, MDPI, ISBN 978-3-03928-342-2 (Pbk), ISBN 978-3-03928-343-9 (PDF).
9. Hoogzaad, J.A., et al. (2020), Climate Change Mitigation through the Circular Economy-A report for the Scientific and Technical Advisory Panel (STAP), to the Global Environment Facility (GEF), Amsterdam, The Netherlands.
10. Climate Change: Business Risks and Opportunities-The Role of Private Sector Adaptation. Elisabeth Resch and Jingjing Gao. Copenhagen Climate Center, UN Environment Programme, 2022, ISBN: 978-87-93458-12-3.
11. The Circular Economy and Climate change Mitigation: A STAP Advisory Document. Scientific and Technical Advisory Panel-STAP, 60th Global Environment Facility-GEF Council Meeting, 2021. UN Environment Programme.