AREA: Urban studies

COURSE: CLIMATE CHANGE AND CITIES (3 credits)

COURSE SYLLABUS

SUMMER 2018 (June 26 - July 27)

INSTRUCTOR: EDGAR LEONARDO VILLARREAL GONZALEZ, PhD

Class hours: 13:00 - 16:00

DESCRIPTION

The course is aimed at the level of students entering university, and is designed to provide an inter-disciplinary introduction to climate change and urban development. It focuses in water resources management from a broad perspective. The course will cover contemporary human-caused climate change within the context of past nature climate variability. Then it will analyze climate change impacts on natural and human systems, as well as potential solutions. These solutions can help avoid the most dangerous climate changes and increase the resilience of societies and ecosystems to those climate changes that cannot be avoided. Finally, it will cover aspects of urban development and its impacts on the water cycle, as well as the challenges of clean water supply for the ever growing cities of our modern world.

LEARNING OUTCOMES

After studying this course, the student should be able to:

- understand the physical basis of the water cycle and the natural greenhouse effect, and differentiate between climate variability and climate change, as well as articulate the difference between weather and climate.
- know the basics of the way various human activities are increasing emmissions of the natural greenhouse gases
- understand that although a growing scientific consensus has become established, the complexities and uncertainties of the science of climate change provide opportunity for climate sceptics to challenge the evidence for human induced climate change.
- Develop an understanding of the process of urbanization and its challenges regarding water resources management

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ORGANIZATION

This is a lecture course in which topics are presented by the instructor, readings will be assigned, and students are encouraged to participate in group discussions during class. Some topics require problem solving: students are encouraged to work in small groups, but answers will be handed-in individually. Essays on some special topics will be assigned, and there is a comprehensive final exam. This basic course assumes no previous knowledge of the topics, and the basic ideas and principles will be covered from scratch.

GRADING PLAN

Coursework will be graded as follows:

- Exercises (problem solving): 30%
- Essays (3 x 10%): 30%
- Final exam: 40%

Essays will be near-weekly short writing exercises that require you to reflect on the assigned reading.

The final exam consists of 25 questions, multiple selection.

Grades: A+:95-100, A0:90-95, B+:85-89, B0:80-84, C+:75-79, C0:70-74, D+:65-69, D0:60-64, F: below 60

Attendance: Please note that, according to University Policies, *anyone who has more than ten hours, unexcused absences will receive an "F" grade for the COURSE.*

COURSE TOPICS

GLOBAL CLIMATE AND THE GREENHOUSE EFFECT

- Introduction to the hydrological cycle and the greenhouse effect
- Climate change: causes and effects
- Records of the Earth's temperature
- Long term tendencies in the climate
- Physical and weather-related indicators
- Environmental indicators

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ASPECTS OF CLIMATE CHANGE

- The impact of climate change on the hydrological cycle
- The carbon cycle
- Basic principles of numerical climate modeling
- State-of-the-art projections about global climate change
- Results of the Intergovernmental Panel on Climate Change (IPCC) and the international commitments on actions

URBAN DEVELOPMENT AND WATER RESOURCES MANAGEMENT

- Historical aspects of urban development urban drainage and public health
- Population growth and the process of urbanization
- Water supply and wastewater management in the cities: present and future challenges
- Effects of Urbanization on the hydrological cycle
- Climate change, urbanization and the heat island effect

REFERENCES AND READING

IPCC (2013) (online) Climate Change 2013: The Physical Science Basis. Working Group I Report.

IPCC (2014) (online) Climate Change 2014: Impacts, Adaptation and Vulnerability. Working Group II Report.

IPCC (2014) (online) Climate Change 2014: Mitigation of Climate Change. Working Group III Report.

Oreskes, N. (2004) The scientific consensus on climate change, Science, 306, p. 1686.

Stokstad, E (2001) Myriad ways to reconstruct past climates, Science, 292, pp. 658-659.

Allen, M. R. and Ingram, W. J. (2002) Constraints on future changes in climate and the hydrologic cycle. *Nature*, **419**, pp 224-232

Scaife, A., Folland, C., and Mitchell, J. (2007) A model approach to climate change. *Physics World*, **February**, pp 20-25

Note on References and Reading: You are not required to buy any texts for this course. The IPCC reports can be downloaded from: <u>https://www.ipcc.ch/</u>. Articles for further reading will be made available by the instructor.