



## Course guide

# 820094 - CCCEEPF - Climate Change: Science, Energy, Economics, Politics and the Future

Last modified: 13/01/2023

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 717 - DEGD - Department of Engineering Graphics and Design.  
749 - MAT - Department of Mathematics.  
748 - FIS - Department of Physics.

**Degree:** BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).

**Academic year:** 2022    **ECTS Credits:** 3.0    **Languages:** Catalan, Spanish

## LECTURER

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**Coordinating lecturer:** OLGA ALCARAZ SENDRA

**Others:** OLGA ALCARAZ SENDRA  
PABLO BUENESTADO CABALLERO  
BARBARA SUREDA CARBONELL

## PRIOR SKILLS

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Not called in; is advisable to have studied the course 820019 - TMS

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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### Transversal:

02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

## TEACHING METHODOLOGY

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The teaching methodology will vary depending on the group in which the student has enrolled, whether face-to-face or non-face-to-face (Virtual asynchronous):

### - Face-to-face

It will be used expository methodology, analysis and development of case studies (mainly with characteristics of self-learning), realization of practices, open debates in class and realization of assessments.

### - Virtual asynchronous

In this case, there will only be a virtual session by meet at the beginning of the semester, in which the operation of the subject will be explained. The rest of the sessions will be asynchronous. Students will have the material of the subject, which will be posted weekly on the Atenea campus. This material will consist of:

- Weekly scheduling of work to be done and deliveries to be made
- Presentations with recorded explanation
- Instructions for carrying out exercises and practices.



## LEARNING OBJECTIVES OF THE SUBJECT

The student should acquire essential knowledge about the climate change problematique, from the point of view of: its causes and scientific manifestations, anthropocentric drivers factors, the world's energy problems, the economic dynamics during the last 200 years, the inability of the political decision to deal with it, and future prospects of everything.

## STUDY LOAD

Type	Hours	Percentage
Self study	45,0	60.00
Hours large group	30,0	40.00

**Total learning time:** 75 h

## CONTENTS

### 1. Presentations and introductions

**Description:**

- Several but important presentations and introductions for the good development of the course in all its aspects

**Specific objectives:**

- Presenting the objectives, program, bibliography, methodology, etc. of course
- Introduction to the work activities and assessment methods.
- Give the key dates of the course during the academic year.

**Full-or-part-time:** 5h

Theory classes: 2h

Self study : 3h

### 2. Science of climate change

**Description:**

- On scientific knowledge it has of the causes and effects of anthropogenic global warming and climate change

**Specific objectives:**

- Understand the scientific principles governing the average temperature at the Earth's surface
- Know the anthropogenic reasons that explain the variation of the temperature and therefore the foundations of global warming and climate change
- Get intensifying the greenhouse effect and its anthropogenic interference with the carbon cycle
- The GHG and CO2 equivalent units
- Know the evidence of climate change from a historical point of view. The main manifestations and effects of global warming

**Full-or-part-time:** 10h

Theory classes: 4h

Self study : 6h



### 3. Energy, economy and climate change

**Description:**

- Factors driving anthropogenic climate change; primary energy vector; and identity  $I = PAT$

**Specific objectives:**

- Understand historical trends and present recent exponential phenomenology of the drivers factors of climate change
- Know the numbers and orders of magnitude of the phenomena. Emissions and concentrations
- Know the  $I = PAT$  identity

**Full-or-part-time:** 5h

Theory classes: 2h

Self study : 3h

### 4. Evaluation of the CO2 emissions associated with the energy mix vector

**Description:**

- Identification of primary energy vectors, and from them, calculating CO2 emissions

**Specific objectives:**

- Know the primary energy vectors
- Apply methods for calculating CO2 emissions associated with fossil-based primary energy

**Full-or-part-time:** 5h

Theory classes: 2h

Self study : 3h

### 5. The Kaya identity and the analysis of the role of the different driven factors in the CO2 emissions

**Description:**

- Learn to understand the role of different factors drivers CO2 emissions

**Specific objectives:**

- Deepen the information that gives us the identity of Kaya
- Analyze the role on different case studies by different factors drivers CO2 emissions

**Full-or-part-time:** 5h

Theory classes: 2h

Self study : 3h



## 6.The multilateral policy and the agendas fighting against climate change

### Description:

- From the environmental summits and the creation of the IPCC ... towards Paris 2015 ... through the UNFCCC, the Kyoto Protocol and the failure of Copenhagen

### Specific objectives:

- Saber de les NNUU, els tractats internacionals i la seva aplicació i evolució en el tema subjecte de l'assignatura
- Descriure la cronologia política i institucional fonamental de la "lluita" contra el canvi climàtic
- Conèixer la UNFCCC
- Conèixer el Protocol de Kyoto
- Saber del fracàs de Copenhagen
- Sobre les diferents responsabilitats històriques

**Full-or-part-time:** 10h

Theory classes: 4h

Self study : 6h

## 7.The Paris Agreement and the future

### Description:

- The Paris Agreement 2015

### Specific objectives:

- Understand and analyze the reasons, characteristics and key elements of the 2015 Paris Agreement
- Future NDCs and its future aggregate analysis

**Full-or-part-time:** 5h

Theory classes: 2h

Self study : 3h

## 8. The IPCC, the assessment reports.

### Description:

- Creation and fundamental role of the IPCC
- The SR15 and the AR6
- Climate scenarios compatible with the objectives of the Paris Agreement

### Specific objectives:

- Know the future scenarios of the IPCC and the possible climate change mitigation objectives in the perspective of the first decade of the century
- The concept of Global Carbon Budget and specific objectives of stabilizing the Earth's temperature

**Full-or-part-time:** 5h

Theory classes: 3h

Self study : 2h



## 9. The SSP scenarios and the NDCs

### Description:

- The IPCC AR6 SSPs scenarios
- The NDCs of the Paris Agreement

### Specific objectives:

- Know the SSPs AR6 scenarios and learn how to calculate carbon budgets and its relation to the objectives of stabilizing land temperatures
- Learning to analyze countries NDCs

### Full-or-part-time: 5h

Theory classes: 2h

Self study : 3h

## GRADING SYSTEM

Face-to-face group:

Attendance and active participation in debates and exercises in the theoretical sessions: 15%

Each of the four sessions of practices: 12% (up to a total of 45%)

Final control: 37%

Asynchronous virtual group:

Delivery of exercises and works: 15%

Each of the four sessions of practices: 12% (up to a total of 48%)

Final control: 37%

## EXAMINATION RULES.

Test type

## BIBLIOGRAPHY

### Basic:

- United Nations. United Nations Environmental Program and CC [on line]. Nairobi: UNEP, 2020 [Consultation: 23/04/2020]. Available on: <http://www.unep.org/climatechange/>.

- International Energy Agency. International Energy Agency [on line]. Paris: IEA, [Consultation: 23/04/2020]. Available on: <http://www.iea.org>.

- United Nations. Intergovernmental Panel on Climate Change [on line]. IPCC, 2020 [Consultation: 23/04/2020]. Available on: <http://www.ipcc.ch>.

- United Nations. United Nations and Climate Change [on line]. New York: United Nations, 2020 [Consultation: 23/04/2020]. Available on: <http://www.un.org/climatechange/>.

- United Nations. Climate Change. United Nations Framework Convention on Climate Change [on line]. Bonn: UNFCCC, 2020 [Consultation: 23/04/2020]. Available on: <http://unfccc.int/2860>.

### Complementary:

- World Resources Institute. CAIT Climate Data Explorer [on line]. Washington: World Resources Institute, 2020 [Consultation: 23/04/2020]. Available on: <http://cait.wri.org/>.

- CAN. Climate Action Network International [on line]. Bonn: CAN, 2020 [Consultation: 23/04/2020]. Available on: <http://www.climateactionnetwork.org>.

- IISD. International Institute on Sustainable Development [on line]. IISD, 2020 [Consultation: 23/04/2020]. Available on: [http://enb.iisd.org/process/climate\\_atm.htm](http://enb.iisd.org/process/climate_atm.htm).