ENV-410  

Science of climate change

Schmale Julia

<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
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<td>Mineur en Ingénierie pour la durabilité</td>
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<tr>
<th>Language</th>
<th>Credits</th>
<th>Session</th>
<th>Semester</th>
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<th>Workload</th>
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<td>Fall</td>
<td>Written</td>
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<tr>
<th>Lecture</th>
<th>Exercises</th>
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<td>2 weekly</td>
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**Summary**

The course equips students with a comprehensive scientific understanding of climate change covering a wide range of topics from physical principles, historical climate change, greenhouse gas emissions, the IPCC assessment to future scenarios and climate action.

**Content**

**The basics:** physics and chemistry of the climate system, historical climate change, climate variability and sensitivity

**Climate change assessment:** IPCC review of present-day climate change, tipping elements, extremes, regional climate change

**Scenarios and carbon budget:** climate change scenarios, remaining carbon budget, climate metrics, short-lived climate forcers/pollutants

**Climate action:** mitigation, adaptation and climate engineering

**Keywords**

Climate change, regional climate change, Earth system, IPCC, greenhouse gases, climate scenarios, climate action

**Learning Prerequisites**

**Required courses**

none

**Recommended courses**

ENV-320 : Physics and chemistry of the atmosphere
ENV-400 : Air pollution and climate change

**Important concepts to start the course**

Basics of physics and chemistry

**Learning Outcomes**

By the end of the course, the student must be able to:

- Express the basic physics and chemistry of climate change
- Discuss the concepts of climate variability and climate sensitivity
- Reason why present day climate change is different from historical climate change
- Contrast climate change scenarios
- Apply simple climate metrics
• Interpret basic climate data and model output
• Critique mitigation, adaptation and climate engineering options

Transversal skills
• Assess one’s own level of skill acquisition, and plan their on-going learning goals.
• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Communicate effectively with professionals from other disciplines.
• Give feedback (critique) in an appropriate fashion.
• Summarize an article or a technical report.
• Access and evaluate appropriate sources of information.

Teaching methods
In-depth teaching. Exercises with educational support. Project work in teams. Discussions.

Expected student activities
Lecture attendance, exercise assignments, project work, presentations

Assessment methods
50 % exercises, 50 % exam

Supervision
Assistants Yes
Forum Yes

Resources
Bibliography

Ressources en bibliothèque
• The Physics of Climate Change / Krauss
• Atmospheric Science / Wallace
• Atmospheric Chemistry and Physics / Seinfeld

Notes/Handbook
lecture slides

Websites
• http://Special report on Global Warming of 1.5°C by the IPCC: https://www.ipcc.ch/sr15/
• http://National Oceanic and Atmospheric Administration, Global Monitoring Laboratory: https://gml.noaa.gov/ccgg/trends/
• http://Global Carbon Project: https://www.globalcarbonproject.org/