The societal challenge

Emissions of CO\textsubscript{2} and ensuing global climate change is one major societal challenge. With unchanged present emissions of about 40 Gt\textsubscript{CO}\textsubscript{2}/year, the carbon budgets for the 1.5°C and 2°C global warming limits will be exhausted within the near future. Consequently, it is necessary to reduce CO\textsubscript{2} emissions significantly and rapidly. Since approx. 80% of current primary energy use is based on fossil fuels, most of the IPCC emission scenarios that meet the global two-degree limit, require that carbon capture and storage (CCS) is deployed for major industrial sectors, such as heat and power and process industries. Considering the limited time available, it may also be necessary to actually remove carbon from the atmosphere, i.e. overshooting the carbon budget at first, followed by removing the excess carbon from the atmosphere. This can be achieved by utilization of biomass together with carbon capture, often referred to as BECCS. In fact, negative emissions on a substantial scale appear to be indispensable to meet the climate targets decided in the Paris agreement. There is currently significant research and development in Sweden and globally to find efficient processes for carbon capture, both at universities and in industry.

- Hydrogen production and carbon capture
- CCS integrated in future energy systems
- BECCS as an option to remove CO\textsubscript{2} from atmosphere, i.e. achieve negative emissions
- The role of CCS and BECCS in an overall carbon mitigation portfolio
- Socio-economic and regulatory barriers for CCS

Course content and tasks

The course will include lectures on relevant topics by experts from Chalmers and industry. There will be individual exercises coupled to the different lecture themes and associated literature. There will then be one main interdisciplinary group project which will be carried out during the course. The project topics can be theoretical or experimental, but will include different interdisciplinary aspects. The projects will be peer-reviewed by fellow students and presented at a workshop at the end of the course. Each project will have a main supervisor from the teaching team, which includes researchers from the Dept. of Space, Earth and Environment, Chemistry and Chemical Engineering, Physics and Technology Management and Economics.

Course formalities

The course corresponds to 7.5 HEC and will be offered September-December, 2022, i.e. over SP1 and SP2. The course is open to students from all Master’s programs at Chalmers, but it is expected to be of special interest for students enrolled in MPSES, MPISC, MPMCN, MPTSE and MPAPE programs. The course can be used as an elective in all programs, but also as a compulsory elective in certain cases.

Interested?

Applications should be sent directly to examiner Prof. Tobias Mattisson at tm@chalmers.se. Please include a motivation letter (max 1 page), including your background and why you are interested in taking the course. Please also include transcripts of taken courses in your current Master’s program. A maximum of 25 students can be enrolled in the course, and the final selection will be made by examiner and teaching team. Application deadline: 31\textsuperscript{st} of May, 2022