

CH-353

**Introduction to electronic structure methods**

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<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Chemistry	BA5	Obl.
Computational science and Engineering	MA1, MA3	Opt.
Computational science and engineering minor	H	Opt.
HES - CGC	H	Opt.
Minor in Quantum Science and Engineering	H	Opt.
Quantum Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

Repetition of the basic concepts of quantum mechanics and main numerical algorithms used for practical implementations. Basic principles of electronic structure methods: Hartree-Fock, many body perturbation theory, configuration interaction, coupled-cluster theory, density functional theory.

**Content**

Short repetition of the basic concepts of quantum mechanics and the main numerical algorithms used for practical implementations. Basic principles of electronic structure methods: Hartree-Fock, many body perturbation theory, configuration interaction, coupled-cluster theory, density functional theory. Overview of computational molecular modelling techniques.

Application of these techniques in a practical research project.

**Learning Outcomes**

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

- Manage basic theoretical concepts of electronic structure methods-
- Carry out simple electronic structure calculations.
- Manage basic theoretical concepts of electronic structure methods-
- Carry out simple electronic structure calculations.

**Transversal skills**

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Make an oral presentation.
- Write a scientific or technical report.

**Teaching methods**

Ex cathedra and exercises on computers

**Assessment methods**

Ongoing controls as follow:

1/3 of final grade = 1 written exam in the middle of the semester

1/3 of final grade = 1 oral exam at the end of the semester

1/3 of final grade = average of the grades obtained on the weekly reports and questions asked on these reports.

## Resources

### Bibliography

- Molecular modelling / Leach
- Modern quantum chemistry / Szabo

### Ressources en bibliothèque

- [Molecular modelling / Leach](#)
- [Modern quantum chemistry / Szabo](#)

### Moodle Link

- <https://go.epfl.ch/CH-353>