MSE-443(b)

Modelling problem solving, computing and visualisation II

Carter W. Craig, Ceriotti Michele

Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Practical work	2 weekly
Number of positions	

Remark

Some of this course will be given via video conference and will be simultaneously taught with an MIT subject

Summary

Covers development and design of models for materials processes and structure-property relations. Emphasizes techniques for solving equations from models or simulating and visualizing behavior. Topics include symmetry, structure, thermodynamics, solid state physics, mechanics, and data analysis.

Content

- Development of Models, Solutions, and Visualization
- Symmetry and Structure of Materials
- Elasticity and Fracture Mechanics
- Monte Carlo Methods
- Molecular Dynamics Methods
- Data Analysis
- Solid State Physics

Keywords

Materials science, modeling, visualization, simulations

Learning Prerequisites

Required courses

MSE 443(a)

Important concepts to start the course

At least intermediate level programming with Mathematica. At least intermediate level knowledge of core materials science topics, calculus, linear algebra.

Learning Outcomes

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

- Analyze models of materials science phenomena
- Visualize results of solutions and simulations
- Model materials science phenomena

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Demonstrate a capacity for creativity.
- Demonstrate the capacity for critical thinking

Teaching methods

Flipped classroom with programming exercises, extemporaneous lectures.

Expected student activities

Students will complete exercises and asked to demonstrate their work to the rest of the class.
Students will need to work on exercises outside of class and present their work to the rest of the class.
Students will develop three projects with formal demonstrations to the class and instructors.

Assessment methods

Grades will be given on project demonstrations and examples of programming in class.

Supervision

Office hours	Yes

Resources

Bibliography

Mathematica documentation.
Electronic Materials from Instructor's website

Ressources en bibliothèque

- Mathematica Demystified / Hoste
- The Mathematica guidebook : for programming / Trott
- Computing with Mathematica / Hoeft