

MSE-443(a)

**Modelling problem solving, computing and visualisation I**

Carter W. Craig

Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	1
Session	Winter
Semester	Fall
Exam	During the semester
Workload	30h
Weeks	14
<b>Hours</b>	<b>1 weekly</b>
TP	1 weekly
<b>Number of positions</b>	

**Remark**

Lectures for this course will only be given for three weeks in the semester; each of those weeks will consist of 4-5 hours in the evenings.

**Summary**

The course will cover programming, numerical simulation, and visualization methods using Mathematica software. Students will be able to apply these skills to their current coursework, and prepared for the companion course (MSE 443(b)) which covers advanced materials science modeling.

**Content**

- Programming constructs in Mathematica
- Functional Programming
- Pattern Matching
- Visualization and Graphics Programming
- Exact and Numerical Simulations of partial differential equations
- Image processing

**Keywords**

programming, visualization, simulations, materials science

**Learning Prerequisites****Important concepts to start the course**

- Calculus and Linear Algebra
- Basic materials science concepts

**Learning Outcomes**

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

- Compute solutions to materials science problems
- Visualize numerical results and material structures
- Elaborate and explain results using visual media

- Integrate several programming techniques
- Manipulate data for fitting and visualization

### Transversal skills

- Demonstrate a capacity for creativity.
- Demonstrate the capacity for critical thinking
- Take feedback (critique) and respond in an appropriate manner.

### Teaching methods

Lectures with in-class exercises

### Expected student activities

Students will be given 3 individual projects, and will prepare a report on a final project.

### Assessment methods

Grades will be computed for each project. Each will be weighted 25%

### Supervision

Office hours                      Yes

### Resources

#### Bibliography

Mathematica Documentation

#### Ressources en bibliothèque

- [Programming with mathematica:an introduction / Wellin](#)

### Prerequisite for

MSE-443(b)