### Scientific programming for Engineers

Anciaux Guillaume

<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
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<tbody>
<tr>
<td>Génie civil &amp; environnement</td>
<td>Obl.</td>
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<td>Génie électrique</td>
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<td>Mécanique</td>
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**Frequency**
Every year

**Remarque**
Every year / Next time: Fall 2019

**Summary**
The students will acquire a solid knowledge on the processes necessary to design, write and use scientific software. Software design techniques will be used to program a multi-usage particles code, aiming at providing the link between algorithmic/complexity, optimization and program designs.

**Content**
Object Oriented Paradigm
C/C++ and Python programming (class, operator, template, design patterns, STL)
Programming techniques, code factorization
Pointers, memory management, data structures
Linear system solving (Eigen library)
C++/Python coupling (pybind)
Post-treatment: Paraview, numpy/scipy, matplotlib

Classical problems: series calculations, solar system and many-body calculation, sparse linear algebra.

**Keywords**
programming, scientific, code design, algorithm, optimization, analysis

**Learning Prerequisites**
- Required courses
- A Linux laptop is required for this class

**Expected student activities**
Exam: 4 evaluated homeworks