

# CETS8AD MATHEMATICA

CETS8AD		ECTS Credits : 2	Semester : S8
Mathematica		Duration : 21 hours	
Person(s) in charge :			
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Keywords : Scientific calculation (graphical, numerical and symbolic), functional programming, pattern recognition programming, data analysis,			
Prerequisites : Mathematics at an undergraduate level.			
Objective : Understand how Mathematica can be an especially powerful and useful tool to solve complicated scientific problems in a smart, efficient and quick way.			
Program and content :			
Teaching goals:			
Mathematica is a general software designed for scientific and technical calculation in various fields such as Physics, Mathematics, Biology, Computer Sciences, Economics, Finance, etc. It makes use of the newly named "Wolfram Language".			
It is especially a high level symbolic language allowing to deal with a wide range of common programming styles in a very flexible way. The essential unifying principle of Mathematica is the concept of expression. Each mathematical object has the same underlying structure, allowing Mathematica to cover various fields with quite a few basic operations and making it very quick and easy for an engineer to solve complex problems.			
The aim of this course is to learn the structure of the Wolfram Langage in order to apply it to various fields of physics, mathematics or computer sciences using different programming styles : iterative programming (classical but not very efficient), object-oriented programming, functional programming, pattern recognition programming, etc, each of those methods having specific advantages according to the nature of the problem to be solved.			
We will also see numerous functions available to directly solve some problems such as numerical or symbolic calculation, graphics functions, functions for data analysis, monte-carol simulations, etc.			
Content			
The first lesson will provide basic knowledge about Mathematica. Each following lessons will highlight a specific programming style with an application to practical problems.			
<div>1. Introduction</div> <div>2. Define functions, pattern matching programming style</div> <div>3. Structure of underlying expressions, lambda functions and functional programming</div> <div>4. Modules and Graphics</div> <div>5. Substitutions</div> <div>6. Solving problems</div> <div>7. Tests - Evaluation</div>			
Teaching materials will be provided, more info on: <a href="http://www.thierryverdel.com">www.thierryverdel.com</a>			
Abilities :			
Levels			
Know	Know the basic principles of Mathematica and the overall range of applications. Know how to use the documentation		
Understand	Understand the main programming styles available in Mathematica		
Apply	Apply those styles to solve different kinds of problems		
Analyse	Know which style of programming is most appropriate to solve a given problem and implement a solution		
Summarise	Know how to translate a given problem into Mathematica code and know how to edit a high quality report about the problem solve, directly in Mathematica		
Assess	Know if a problem can be solved with Mathematica and assess the time and the methods necessary to solve it		
Evaluations :			

<input checked="" type="checkbox"/> Written test	<input checked="" type="checkbox"/> Continuous Control	<input type="checkbox"/> Oral report	<input checked="" type="checkbox"/> Project	<input checked="" type="checkbox"/> Written report
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