



Mathématique et Mécanique

Semester 6 -

MODULE	UV	TITLE	PARTICIPANTS	ECTS	
	M6-C	Scientific computing II	L. MIEUSSENS (resp)	10.00	
AN103		Numerical tools for Mechanics	L. MIEUSSENS (resp) O. SAUT R. TURPAUT	5.00	page 0
PG115		Research and Computing Project	D. AREGBA (resp) N. BONNETON S. BRULL (resp) O. CATY B. DUBROCA P. LUBIN L. MIEUSSENS L. WEYNANS	3.00	page 0
PG118		Scientific Computing in Fortran90 -II	C. DELEDALLE B. DENIS DE SENNEVILLE M. DURUFLE L. MIEUSSENS (resp) S. PELUCHON L. WEYNANS	2.00	page 0

AN103 : Numerical tools for Mechanics

Shared by UV(s) :

M6-C Scientific computing II

page 0

ECTS credits :

5.00

Evaluation :

S1: ET(2h,E,sd,sc) x1

Number of hours :

Lecture : 20.00

Tutorial classes : 24.00

Teacher(s) :

MIEUSSENS Luc

SAUT Olivier

TURPAUT Rodolphe

Title :

Numerical tools for Mechanics

Abstract :

The goal of this course is to show some fundamental elements of numerical approximation of partial difference equations. It will be restricted to linear problems, like diffusion and convection, since these phenomenons can be observed in most of mechanical problems. Most of the course will be devoted to the method of finite differences for one dimensional problems. Main notions like accuracy, stability, convergence, numerical diffusion and dispersion, will analyzed. Concrete examples will be discussed (heat equation, convection of a pollutant in a river, acoustic wave propagation, etc.).

Plan :

- PDEs in Mechanics
- The heat equation
- Approximation of derivatives with finite differences
- Numerical approximation of the unsteady heat equation by finite differences
- The convection equation
- Numerical approximation of the unsteady convection equation by finite differences

Prerequisite :

- calculus
- linear algebra

Document(s) :

The course is based on the following book:

- Finite Difference Methods for Ordinary and Partial Differential Equations, Steady State and Time Dependent Problems, Randall J. LeVeque, SIAM, 2007

Other useful references are:

- Finite Difference Schemes and Partial Differential Equations, Second Edition J. C. Strikwerda, SIAM 2004

PG115 : Research and Computing Project

Shared by UV(s) :

M6-C Scientific computing II

page 0

ECTS credits :

3.00

Evaluation :

S1: Proj(Sout+Rap+PA) x1;

Number of hours :

Individual work : 50.00

Teacher(s) :

AREGBA Denise
BONNETON Natalie
BRULL Stéphane
CATY Olivier
DUBROCA Bruno
LUBIN Pierre
MIEUSSENS Luc
WEYNANS Lisl

Title :

Research and Computing Project

Abstract :

Réalisation d'un projet mettant en oeuvre l'ensemble des notions acquises en première année dans les domaines de la mécanique, des mathématiques et de la simulation numérique. Il est encadré par deux enseignants.

Document(s) :

Un document d'explication sur le fonctionnement du module est distribué en début d'année. Des documents techniques sont fournis par les tuteurs.

PG118 : Scientific Computing in Fortran90 -II

Shared by UV(s) :

M6-C Scientific computing II

page 0

ECTS credits :

2.00

Evaluation :

S1: Proj(Rap) x3 + CC(PA,CR TP) x1

Number of hours :

Practical work : 20.00

Teacher(s) :

DELEDALLE Charles-Alban
DENIS DE SENNEVILLE Baudouin
DURUFLE Marc
MIEUSSENS Luc
PELUCHON Simon
WEYNANS Lisl

Title :

Scientific Computing in Fortran90 -II

Abstract :

The goal of this module is to consolidate the notions of programming in Fortran 90 already seen at the previous semester (PG102). The main application will be the implementation of finite difference methods presented in the course "numerical tools for Mechanics" (AN103).