

# L<sup>A</sup>T<sub>E</sub>X



## Transversal trainings for doctoral students

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# Writing your thesis effectively in LaTeX



# Why LaTeX ?

LaTeX is a tool that makes it easy to write structured texts with uniform presentation and complex mathematical formulas

```
Pour quelles valeurs du paramètre $m$, l'équation
\[
x^{2}-(m+1)x+2-m=0
\]
a-t-elle deux racines positives différentes?

On sait que
\[
0 < x_{1} < x_{2} \Leftrightarrow D > 0 \text{ et } P > 0 \text{ et } S > 0.
\]

Ici, on calcule
\begin{align*}
D &= (m+1)^{2} - 4(2-m) \\
&= m^{2} + 6m - 7 \\
&= (m-1)(m+7), \\
P &= 2-m, \\
S &= m+1.
\end{align*}
```



Pour quelles valeurs du paramètre  $m$ , l'équation

$$x^2 - (m + 1)x + 2 - m = 0$$

a-t-elle deux racines positives différentes ?

On sait que

$$0 < x_1 < x_2 \Leftrightarrow D > 0 \text{ et } P > 0 \text{ et } S > 0.$$

Ici, on calcule

$$\begin{aligned} D &= (m + 1)^2 - 4(2 - m) \\ &= m^2 + 6m - 7 \\ &= (m - 1)(m + 7), \\ P &= 2 - m, \\ S &= m + 1. \end{aligned}$$



# Objectives

After this course, participants should be able

- ▶ to encode usual scientific documents in LaTeX such as
  - articles
  - reports
  - books
  - slide presentations
- ▶ to insert into these documents
  - mathematical formulas
  - tables
  - pictures
- ▶ to structure the documents by inserting
  - chapters, sections, etc.
  - a table of contents
  - an index



# Content of the course

Basic part (document class = article, AM 3h)

- ▶ Basic template
  - explanation of the preamble
- ▶ Paragraphs
- ▶ First mathematical formulas
- ▶ Tables
  - Mathematical tables
  - Text tables
- ▶ Enumerations and lists of items
- ▶ Pictures
- ▶ Document structure
  - Sections, subsections, etc.
  - Table of contents



# Content of the course

## Different classes of documents (AM, 1/2h)

- ▶ Article class
  - Abstract
  - French version
  - English version
- ▶ Book class
  - Structure : example of a master document and separated files for chapters
  - Index
  - One sided version
  - Two sided version
- ▶ Report class
  - Abstract
  - French version
  - English version



# Content of the course

## Different classes of documents

- ▶ Beamer class
  - Title slide
  - Content slides
  - Predefined themes
  - Colors
  - Animations



# Content of the course

Advanced course (document class = article, PM 3h)

- ▶ Matrices
- ▶ Determinants
- ▶ Systems of equations
- ▶ Advanced mathematical formulas including
  - Symbols and operators
  - Predefined mathematical functions
- ▶ Definition of new operators
- ▶ Definition of new commands (macros)
  - That may depend on one or more parameters
- ▶ Advanced document structure
  - Insertion of definitions, propositions, theorems and proofs
- ▶ Intra document citations
  - Formulas
  - Propositions
  - Etc.





# Methodology

- ▶ Each participant works on a computer of the IT room of the Institute of Mathematics
  
- ▶ The basic template can be downloaded from the course web page
  - To avoid typing errors
  - To explain each line of the preamble more easily
  
- ▶ Basic and advanced lectures
  - Each point is briefly explained
    - Using simple examples
    - Specifying the packages to be added to the preamble
  - Participants receive a short part of a book
    - Containing examples that have just been explained
    - To be encoded in LaTeX by themselves



# Methodology

During the basic lecture

- ▶ The particularities of each class of document are explained
- ▶ Due to time constraint, it is however not possible to propose exercises for every usual type of documents



# Course material

- ▶ Reference book : [More Math into LaTeX / George Grätzer](#)
  
- ▶ Course web page : <http://www.anmath.ulg.ac.be/fp/fdoclatex/>:
  - Instructions for installation
  - Minimal template

} Available before the lecture

  - Example with article class
  - Example with book class
  - Beamer example
  - Example of PDF file inclusion
  - Example of Excel graphic inclusion
  - Example of a report

} Available after the lecture

# Encoding references in BibTeX and citing them in LaTeX



# Why BibTeX?

BibTeX is a tool to easily manage the bibliography of a LaTeX document

```
@Book{bellman73,  
  title      = {Methods of Nonlinear Analysis. \textup{Vol. II}},  
  publisher  = {Academic Press},  
  year       = {1973},  
  author     = {Bellman, Richard},  
  number     = {61-II},  
  series     = {Mathematics in Science and Engineering},  
  address    = {New York},  
  isbn       = {0-12-084902-X},  
  pages      = {XVII, 261},  
  language   = {english},  
}  
  
@ARTICLE{donatini07,  
  author = {Donatini, Pietro and Frosini, Patrizio},  
  title = {Natural Pseudodistances between Closed Surfaces},  
  journal = {Journal of the European Mathematical Society},  
  year = {2007},  
  volume = {9},  
  pages = {331--353},  
  number = {2},  
  language = {english}  
}
```



## Références

- [1] Kenneth J. Arrow *et al.*, *Studies in linear and non-linear programming*, Stanford Mathematical Studies in the Social Sciences, n° II, Stanford University Press, Stanford (CA), 1958.
- [2] Roger Astier, *Méthode Box Jenkins appliquée aux séries de transport*, Thèse de doctorat de 3<sup>e</sup> cycle, spécialité : statistiques, Université de Paris-Sud, Centre d'Orsay, février 1982.
- [3] Edwin F. Beckenbach (éd.), *Modern mathematics for the engineer*, University of California Engineering Extension Series, McGraw-Hill, New York, 1956.
- [4] Richard Bellman, *Methods of nonlinear analysis*, 2 vol., Academic Press, New York, 1970–1973.



# Objectives

After this course, participants should be able

- ▶ to build a BibTeX database with their bibliographic references
- ▶ to import in this database bibliographic references from other databases such as Scopus, ZbMath, MathSciNet or a discovery tool like Primo
- ▶ to include a bibliography into a LaTeX document
- ▶ to cite referenced works when needed in the document



# Content of the course (1 / 2 day)

- ▶ Encoding bibliographic references of different types of scientific documents in BibTeX :
  - Books :
    - with one or more authors
    - in one or more volumes
    - translated from another language
  - Articles of scientific journals
  - Conference proceedings
  - Theses
  - In paper or electronic format
- ▶ Insertion of a bibliography in a LaTeX document
- ▶ Citation of a reference in the LaTeX document
- ▶ Importation of references from scientific databases



# Methodology

- ▶ Each participant works on a computer of the IT room of the Institute of Mathematics
- ▶ The encoding of a simple reference in BibTeX is explained. For this, we use JabRef which provides a user-friendly interface for editing BibTeX files
- ▶ A folder containing
  - printed copies of both sides of the title pages of about twenty documents
  - a printed version of references in the main bibliographic stylesis distributed to participants. They are invited to encode these references in BibTeX using the most appropriate style for their disciplines
- ▶ Finally, the importation of references from scientific databases is explained





# Course material

- ▶ Course web page : <http://www.anmath.ulg.ac.be/fp/fdoc5/>



# Difficulty of organization

LaTeX

- ▶ Participants come from completely different disciplines



Needs are not the same

Conventions vary from one discipline to another



# Difficulty of organization : example

Nom	Analyse	Algèbre	Géométrie	Moyenne
Jacques	15	14	16	15
Jean	12	16	14	14
Michel	16	14	18	16

TABLE 1 – Résultats de math

```
\usepackage{caption}  
\captionsetup{justification=raggedright,singlelinecheck=false}
```

TABLE 1 – Résultats de math

Nom	Analyse	Algèbre	Géométrie	Moyenne
Jacques	15	14	16	15
Jean	12	16	14	14
Michel	16	14	18	16



# Difficulty of organization

## LaTeX

- ▶ Participants are often surprised that LaTeX training does not include BibTeX training



# New organization ?

- ▶ Basic course ( 1 day)
  - Basic part (document class = article, AM 3h)
  - BibTeX (PM, 3h)
  
- ▶ Different classes of documents (1/2 day)
  
- ▶ Advanced course (1/2 day)
  
- ▶ Q&A session (1/2 day)

Thank You !