

SEMESTER 9_5th YEAR ModIA

Practical info

Location(s)

Q Toulouse





Data Assimilation





Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

-The general concepts behind Data Assimilation

-The key step to predict the state of a system by combining models and observations: formal definition of a dynamical system, error specification, interpretation of results

-Methods fro handling nonlinearity and large scale

- -Variationnal methods for Data Assimilation
- -Ensemble methods for Data Assimilation

At the end of this module, the student should be able to:

-Analytically solve a vairaitonnal Data Assimilation problem

-Design a data assimilation system using a description of a system using partial differential equation

-Assess the performance of a system, question the relevance of the mathematical assumptions

Necessary prerequisites

Numerical algebra for large scale, statistical estimation, non-convex smooth optimization, numerical solution of PDEs

Practical info

Location(s)

Q Toulouse





Modeling & Finite Elements

Introducing

ECTS

3 crédits

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Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

-How to model and to compute with the Finite Element Method (FEM) classical systems of PDEs.

At the end of this module, the student should be able to:

¿ write the weak (variational) form of the classical PDE models (with the corresponding energy minimization, symmetric case).

¿ Understand the mathematical analysis of classical PDE models.

¿ Model and compute with the FEM various classical phenomena (diffusive, convective, elasticity, etc.) which are ubiquitous in physics, process.

 ¿ Employ Finite Element libraries, e.g. Fenics (in Python)
 ¿ Implement advanced computational techniques in case of large-scale modeling (model reduction, coupling of numerical models and codes).

Necessary prerequisites

Fundamentals of PDE models, math. analysis,

Basic numerical methods-analysis.

Practical info

Location(s)

Q Toulouse

Hourly volume

68h







Design of experiments and metamodels

Hourly volume

64h

Introducing

3 crédits

ECTS

0

Necessary prerequisites

Linear model, Gaussian vectors.

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

-The main methods of experimental design

-Metamodelling for optimization / uncertainty guantification of a black-box function

-At least the two main families of metamodels : chaos polynomials and Gaussian processes

-Kernel customization to account for external knowledge

-Design of computer experiments

-Global sensitivity analysis

The student should be able:

Experimental Design part. -Plan an experiment in the framework of a linear model

Metamodels part.

-At a theoretical level, to do computations for:
-covariance kernels and Gaussian process
-ANOVA decomposition, Sobol indices
-At a practical level, to perform the complete methodology for analyzing a black-box function :
-design of experiments
-metamodel construction / evaluation
-application to optimization / uncertainty quantification

Practical info

Location(s)

Toulouse





[FRANCAIS] Processus de Poisson et applications

4 crédits

ECTS



Hourly volume 59h

Introducing

Objectives

At the end of this module, the student should be able to:

Analyze and exploit the structure of a system to derive its reliability from the characteristics of its components.
Model the recursive occurrences of the failures on a system or the claim times in insurance by Poisson processes.

• Compute or approximate the ruin probability of insurance derivatives. Use machine learning techniques in actuarial sciences.

• Know the theoretical foundations of the Monte-Carlo method and be able to make use of it within the scope of its applicability and limitations.

• Identify the specific linguistic characteristics of the English used in scientific contexts, and to present their work orally and in written form following this scientific style.

• Write a scientific report in English on their project, respecting the conventions of their field.

Present project work orally in English and dialogue on key elements of their project in a structured manner.
Select relevant information for specific audiences.

• Explain complex scientific and technical concepts to non-specialists.

 \cdot Adapt their expression for formal and informal presentations.

Necessary prerequisites

- -Markov chains and applications (MIC3)
- -Inferential Statistics (MIC3)
- -Statistical Modelling (ModIA S7)

Practical info

Location(s)



Non-contractual information





Human sciences



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Hourly volume 41h

Introducing

Objectives

Aims

The student will learn how to:

¿ Analyze group situations using social psychology concepts

¿ Identify the ethical dimensions of these situations and take a stance

¿ Identify and understand HR-related information

¿ Analyze a team management situation in a theoretical context

¿ Formulate and justify managerial decisions

¿ Take an active role within the group

¿ Fulfill their career objectives, build a strategic plan and acquire job searching skills

Necessary prerequisites

None

Practical info

Location(s)

Toulouse





[FRANCAIS] Formation en entreprise 3





Hourly volume

Practical info

Location(s)

Q Toulouse

