4th YEAR MA INSA_SEMESTER 7

Practical info

Location(s)

Toulouse

Partial Derivative Equations & Monte Carlo methods

ECTS
4 crédits

Hourly volume
53h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
PDE
- The four fundamentals PDE models, with their solution behaviors
- The Finite Difference discretization method

Monte-Carlo
- The fundamental principles of simulating random variables and Monte-Carlo methods.

The student will be able to:
PDE
- To model basic fundamental phenomena by employing PDE
- To derive a Finite Difference scheme (consistent, stable, convergent).

Monte-Carlo
- Simulate a random variable by different methods, use probabilistic, choose appropriate techniques for variance reduction and error estimation.

Necessary prerequisites

EDP
Differential calculus, analysis, ODE
Basic numerical methods

Monte-Carlo
A basic course on probabilities.

Practical info

Location(s)

Toulouse

Advanced probability and Monte Carlo methods

ECTS
4 crédits

Hourly volume
53h

Introducing

Objectives

Objectives:
At the end of this module, the student will have understood and be able to explain (main concepts):
- The notion of conditional expectation, the main properties of martingales and their classical use in modelling,
- Stochastic algorithms of Robbins-Monro type.
- The fundamental principles of simulating random variables and Monte-Carlo methods.

The student will be able to:
- To compute a conditional expectation, to show that a random process is a martingale, to use the various theorems (Doob, optional stopping and convergences), in particular for the maximum likelihood estimation.

- Build and study the convergence of stochastic optimization algorithms, apply these methods to different problems (quantile, quantization,¿)

Simulate a random variable by different methods, use probabilistic, choose appropriate techniques for variance reduction and error estimation

Necessary prerequisites

Necessary knowledge:

A basic course on probabilities.

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Realize a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect the market data and put in action a business plan adapted to the means and goals of the company
Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied Chinese, German, Spanish ¿ and the level of the student.

They can be consulted on :

https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Toulouse School of Management

Practical info

Location(s)

Toulouse

Optimisation II

ECTS
4 crédits

Hourly volume
54h

Introducing

Objectives

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

- Deterministic differentiable optimisation :
Existence and unicity of optimisation problems, KKT points, Convergence of optimization algorithm, Lagrangian duality

- Discrete stochastic optimisation :
The Metropolis-Hastings algorithm, the simulated annealing algorithm, genetic algorithms.

The student will be able:
- To identify families of optimization problems
- To choose and implement suitable first and second order algorithms
- To implement a Metropolis-Hastings algorithm in order to simulate, approximately, a given discrete probability distribution on a huge finite space.
- To implement a simulated annealing algorithm in order to minimize a given function on a huge finite space.

Necessary prerequisites

Optimisation I
Markov chains and applications

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Signal Processing 1

ECTS
4 crédits

Hourly volume
43h

Introducing

Objectives

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

1) Signal and Image processing basic notions : sampling, windowing and sampling
2) FFT algorithm
3) Basis notions on Hilbert spaces and Hilbert bases

The student will be able to:

1) Use the FFT and understand the output on a Signal or an image.
2) Apply several transformations to a signal and an image using the FFT

Practical info

Location(s)

Toulouse

INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Statistical Modelling

ECTS
4 crédits

Hourly volume
53h

Introducing

Objectives

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

-The use of statistical tests for goodness-of-fit, independence, populations comparisons
-The characteristics of a linear model and a generalized linear model, and their use for statistical modelling

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

-Choose a test procedure suited to a given problem
-Build nonparametric test procedures to compare two populations
-Build goodness-of-fit tests for a single distribution or a family of distributions
-Choose a linear model or a generalized linear model suited to a given problem
-Estimate the parameters in a linear model and a generalized linear model
-Use statistical tests to validate or invalidate hypotheses on these linear models and generalized linear models.
-Implement a variable selection strategy
-Perform a complete statistical analysis on a real data set using a linear model or a generalized linear model

Necessary prerequisites

Probability and Statistics (I2MIMT31)
Statistics (I3MIMT15)

Practical info

Location(s)

Toulouse

HPC, Matrix Computations and Large Sparse Systems

ECTS
4 crédits

Hourly volume
59h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
Eigenproblems :
- Different eigenproblems, their conditioning and Schur¿s factorization,
- Different methods for eigenvalue problems : power method, orthogonal iterations, QR method and Krylov subspace methods.

HPC :
This module is focused on the presentation of the basic mechanisms used to achieve high performance on modern computers. The language used by the students will be Python/C with which they¿ll learn to implement some MPI. They will also learn to program some Krylov¿s solvers as well as the LU factorization and to efficiently solve Poisson¿s equation discretized with finite differences.

Sparse systems :
- Principle and some strategies for sparse storages,
- Principle of different projection techniques to define iterative methods for solving sparse linear systems,
- Principle of different preconditioning techniques
- Principle of some reordering techniques to solve sparse linear systems with direct methods.

The student will be able to:
Eigenproblems :
Understand the difficulties of a problem, and choose a method.
Paradigms and langages :
At the end of this module, students will be able to develop and to maintain Python / C software codes, to analyze applications performances and to supplement them with MPI/OpenMP directives in order to enable a parallel execution.

Sparse systems :
Chose one or a few methods adapted to a given linear system.

Necessary prerequisites

- Precedent courses on the following subjects : linear algebra, numerical analysis.
- Knowledge of the imperative programmation language main concepts (Python and C).

Practical info

Location(s)

Toulouse

Quality, security, environment

ECTS
2 crédits

Hourly volume
35h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- Mains concepts and tools for ¿quality¿
- The principles and stakes in the health and in the safety at work.
- The main concepts of the IT security.
- The importance of the environmental strategy in a company.

The student will be able to:
- Integrate the aspects of Quality, Security, Environment into the analysis of problems and the development of solutions.
- Be capable of taking into account the environmental stakes and applying the principles of the sustainable development.

Practical info

Location(s)

Toulouse

Improving one's autonomy and building one's own professional project level 2 S7

ECTS
4 crédits

Hourly volume
46h

Introducing

Objectives

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

Physical and Sports Activities
The student will be able to:
to list the problems to be solved:
¿ Know the Physical and Sports Activity (rules, meaning, roles, etc.),
¿ Design the objective of the project.
to organize:
¿ Know the constraints, the resources, and the means available,
¿ Know how to choose and plan actions over time,
¿ Know how to get involved in the group and the project: know how to adapt, dare to stimulate action, know how to give up, propose, etc.
to regulate:
¿ Know how to observe,
¿ Know how to carry out a balance sheet,
¿ Know how to readjust the choices if necessary.

Individualized Professional Project
The student should be able to:
¿ Develop your professional vision and define a strategy.
¿ Customize, present and compare your project to professionals
¿ Enrich your professional network
¿ Set development axes, objectives and action plans

Necessary prerequisites

Learning outcomes 1st, 2nd, 3rd year.

Practical info

Location(s)

Toulouse

Political sciences semester 1

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse