Program Directors: Stéphane Villeneuve (1st year) Eric Gautier (2nd year)

DIPLÔME NATIONAL DE MASTER CONTRÔLÉ PAR L'ÉTAT

Program 2022-2023

The two-years Master's program in Mathematics and Economic Decision is the Toulouse School of Economics Master in Applied Mathematics and Statistics. It benefits from the strength of both the TSE's Mathematics and Economics departments. Interdisciplinarity is very important in recent developments in research, for example at the interface between optimization and statistics. These developments have wide and natural applications in economics and in the industry: artificial intelligence, big data, game theory, high-dimensional analysis, machine learning, network analysis, stochastic analysis, etc.

The first year is dedicated to acquiring a broad and rigorous knowledge in mathematics and statistics and its applications to economics.

The second year of this program is targeted to students interested in research-based training in Applied Mathematics and Statistics. It can be regarded as a first year of a Ph.D. program in the north American system. Successful students who would be interested in a PhD in Applied Mathematics and Statistics can apply for scholarships with the support of the program faculty to complete their PhD in Toulouse or outside of Toulouse. The Ph.D. can be either academic or professionally oriented. The second year of the Master can also be a good fit for a student interested by research-based learning but who prefers a professional integration directly after the Master, for example as a mathematical engineer with a strong background in Economics.

Alternatively, after the first year, the students may apply to other second year Master's programs at TSE. The second year of the Master Data Science for Social Science is particularly suited for a professional integration after the Master. Students who become more interested in the Ph.D. in Economics may apply to the second year of the Master Economic Theory and Econometrics.

Note: students can apply either to the full program (i.e. two years) or directly to the 2nd year (find further information to the admission section)

First year courses – Mathematics and Economic Decision:

SEMESTRE 1	SEMESTRE 2
Core courses: • Mathematical Statistics 1* • Intermediate econometrics* • Mathematical Game Theory 1 • Advanced Analysis* • Professional Development • FLE	**Core courses:** • Mathematical Statistics 2* • Mathematical Game Theory 2 • Program Evaluation* • Games and Equilibria* • FLE
Electives: **2 among 4:** • Macroeconomics • Markov Chains and applications • Optimization • Theory of Incentives **1 among 7 (at least one course **):** • Macroeconomics* • Theory of Incentives • Probability Modeling • Environmental Economics • Economic History • Evolution of economic behaviour • Project Management	**Electives (UE12 OR UE13):** **UE 12 : 4 among 7 towards doctoral tracks** **in Economics :** • Martingales theory and applications • Advanced Macroeconomics • Advanced Microeconomics • Corporate finance** • Industrial Organization** • Market finance** • Dynamic optimization **UE 13 : 4 among 7 towards MED 2 track :** • Martingales theory and applications • Introduction to big data**+ • Corporate finance** • Market finance** • Optimization for big data**+ • Dynamic optimization • Time series**
End of August refresher courses – Math Camp: • Algebra refresher *** • Probability refresher *** • Static Optimization refresher ***	Internship or Master thesis*

* Core courses : UE1/UE2/UE5. A minimum score of 10 out of 20 is required

** Masters 2 Directors recommend to attend some options:
- *Introduction to Big Data or Optimization for Big Data or Data Bases or Time Series: M2 Stateco*
- *Industrial Organization: M2 EMO*
- *Environmental & Resource Economics : M2 ERNA*
- *Economics of human development: M2 PPD*
- *Corporate Finance et Market Finance: M2 Finance*
- *Time Series: M2 EEE*

*** Mathematics refresher courses, for TSE M1 and M2 students

+ Introduction to big data and Optimization for big data courses are opened to the first 45 registered students (on the come first/first served basis).

Second Year courses – Mathematics and Economic Decision

SEMESTER 1	SEMESTER 2
Core courses: • Reading Course **Electives (choose 18 credits):** • Optimization • Mathematics of Machine and Deep learning Algorithms • Game Theory • Microeconomics 1 • Econometrics 1 • Topics in MED 1 or 2 **** • Optimization for deep learning • Non-parametric models • Survey sampling • Lifetime analysis • Advanced Topics in Artificial Intelligence** • Techniques du Décisionnel et Big Data***	**Core courses:** • Reading Course • Master thesis or Internship **Electives (choose 3):** • Stochastic Optimal control in economics • Econometrics 2 • Big Data • Microeconomics 2 • Corporate finance : Theory and empirics • Economic Theory • Topics in EEE • High-Dimensional Models • Topics in MED 3 or 4 **** • Capital Markets
Non-Mandatory: • *Algebra Refresher ** • *Probability Refresher ** • *Dynamic Optimization Refresher **	**Non-Mandatory:** • Statistical software : R, Python

Refresher course in mathematics, open to M1 and M2 students of the School
**Corresponds to the UE3 Management and decision of the Master 2 2IS*
*** One course of your choice from UE3 Technologies du décisionnel of the Master 2 ISIADE*
**** Course of your choice*
- or Possibility of following a course given by a guest professor (subject to validation by the Master's pedagogical director)
- or Possibility of following a course from a research school (subject to validation by the Master's director)
- or Possibility of taking courses in other Master 2 programs (subject to validation by the Master's director)

First year Acceptance criteria and enrollm
• Students with an undergraduate degree who m
  Mathematics at the Toulouse School of Econor
  level (TOEFL, IELTS or Cambridge English Ad
  eligible to enroll in the M1 Econometrics and S