Toulouse School of Economics

Master in Mathematics and Economic Decision

Program Directors:Stéphane Villeneuve and Eric Gautier

Program 2022-2023

DIPLÔME NATIONAL DE MASTER CONTRÔLÉ PAR L'ÉTAT

The two-year 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* • Advanced Analysis* • Strategic Optimization* • Professional Development • FLE	**Core courses:** • Mathematical Statistics 2* • Program Evaluation* • Mathematical Game Theory 2
Electives: **2 among 4:** • Macroeconomics* • Markov Chains and applications+ • Optimization • Theory of Incentives	**Electives:** **4 among 7 towards M2 MED:** • Martingales theory and applications • Optimization for big data**+ • Corporate finance** • Market finance** • Dynamic optimization • Introduction to big data**+ • Time series** **4 among 7 towards doctoral track:** • Advanced Macroeconomics • Advanced Microeconomics • Corporate finance** • Market finance** • Dynamic optimization • Industrial Organization** • Martingales theory and applications
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 [1] **Electives (choose 18 credits):** • Optimization (6 ECTS) • Topics in MED 1 **** (6 ECTS) • Topics in MED 2 **** (half a course: 3 ECTS) • Mathematics of Machine and Deep learning Algorithms • Game Theory (6ECTS) • Microeconomics 1 (6 ECTS) • Econometrics 1 (6 ECTS) • Non-parametric models (half a course: 3 ECTS) • Survey sampling (half a course: 3 ECTS) • Optimization for deep learning (half a course: 3 ECTS) • Advanced Topics in Artificial Intelligence** (6 ECTS) • Techniques du Décisionnel et Big Data***(3 ECTS)	**Core courses:** • Reading Course 1 • Master thesis or Internship **Electives (choose 18 credits):** • Stochastic Optimal control in economics (6 ECTS) • Econometrics 2 (6 ECTS) • Big Data (6 ECTS) • Microeconomics 2 (6 ECTS) • Topics in Econometrics and empirical economics (6 ECTS) • Economic Theory (6 ECTS) • Capital Markets (TSM) (6 ECTS) • Corporate Finance: Theory and empirics (TSM) (6 ECTS) • High-Dimensional Models (half a course 3 ECTS) • Topics in MED 3 **** • Topics in MED 4 **** (half a course/ 3 ECTS)
Non-Mandatory: • *Algebra Refresher* • *Probability Refresher* • *Dynamic Optimization Refresher* • *Statistical Software: R.* • *Statistical Software: Python*	Thesis or internship

[1] Each student is supervised by a professor who assigns him/her with reading assignments at the graduate and research level. The students have to produce a manuscript and a presentation of the type of a research seminar in 1 hour around a selected aspect and present sketches of proofs.

**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 in Semester 3 or 4 (subject to validation by the Master's pedagogical director):*
- or Possibility of following a course given by an invited professor
- or Possibility of following a course from a research school
- or Possibility of taking courses in other Master 2 programs (for example from the master RI)

First year Acceptance criteria and enrollment

- Students with an undergraduate degree who majored in Economics or Economics and Mathematics at the Toulouse School of Economics TSE and able to justify a good English level (TOEFL, IELTS or Cambridge English Advanced Certificate C1 level required) are eligible to enroll in the M1 program “Mathematics of Economic Decision", international track entirely taught in English.

- Or by application review:
  - Students with an undergraduate degree in an economic and mathematics field or mathematics field;
  - French or foreign students with a degree and credits considered equivalent, and able to justify a good English (TOEFL, IELTS or Cambridge English Advanced Certificate C1 level required) and Mathematics Level (GRE required for foreign students).

Second year - Acceptance criteria and enrollment

Students majored in the M1 program "Mathematics and Economic Decision" are eligible to enroll in the M2 program.

- Or by application review:
  - Holders of a master's degree in mathematics who can justify some knowledge of Economics or are willing to prepare for it before the beginning of the program and who are able to justify a good English level, international track entirely taught in English.

Application Process

Applications are considered in November for Eiffel scholarships applicants, in January for other foreign degree holders and French degree holder for the 1st year Master only and in May for French degree holders for the second year : www.tse-fr.eu/admissions

Information

Administration:
Building T – 1st floor
Université Toulouse 1 Capitole
1 esplanade de l’Université
31000 Toulouse
Tel: +33 (0)5 61 12 86 54
Website: www.tse-fr.eu
Email: scoltsem1@ut-capitole.fr
Admission Office: TSE-studentsrecruitment@ut-capitole.fr

Program Director:
1st year Master program Stéphane Villeneuve : stephane.villeneuve@tse-fr.eu
2nd year Master program: Eric Gautier - eric.gautier@tse-fr.eu