

Program 2023-2024



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)

Courses

First year– Mathematics and Economic Decision

SEMESTRE 1	SEMESTRE 2
Compulsory courses: • Intermediate econometrics* • Probability and Statistics for Data Science* • Functional Analysis ou Advanced Analysis • Introduction to Convex Optimization for Machine Learning* • Computational Data Science (Python) • FLE • Professional Development	Compulsory courses: • Foundations of Machine Learning • Mathematical Game Theory • FLE Compulsory only if you choose the track Towards the second year of master MED below: • Advanced Optimisation / Games /Statistics (content of the course to be announced later)* • Markov Decision Processes *
Optional: 2 among 5: • Markov Chains and applications • Markets and Incentives: a historical-theoretical perspective • Macroeconomics • Theory of Incentives • Market Power and Regulation End of August refresher courses – Math Camp: • Algebra refresher *** • Probability refresher *** • Static Optimization refresher *** • Economics Refresher ***	Optional: Towards the second year of master MED track:* (3 electives from 7) • Martingales theory and applications • High Dimensional Data Analysis and Machine Learning • Stochastic Methods for Optimization and Sampling • Corporate finance • Market finance • Time series • Dynamic Optimization Econometrics and Economics Track:* (5 electives from 9) • Martingales theory and applications • Industrial Organization ** • Corporate finance** • Market finance** • Dynamic optimization • Advanced Macroeconomics** • Advanced Microeconomics** • Program Evaluation** • Time Series ** • Advanced Optimisation/Games/Statistics • Stochastic Methods for Optimization and Sampling** • High Dimensional Data Analysis and Machine Learning** • Markov Decision Processes
	• Internship or Master thesis++

* Students choose to follow either the MED track or the PhD track

*** Refresher courses, for TSE M1 and M2 students

++UE15 A minimum grade of 10 out of 20 is required.

** Masters 2 Directors recommend to attend some options:

- Industrial Organization: M2 EMO
- Corporate Finance and Market Finance: M2 Finance
- Time Series: M2 EEE
- Program Evaluation : M2 EEE, M2 ETE
- Advanced Macroeconomics: M2 ETE
- Advanced Microeconomics: M2 ETE

Second Year– Mathematics and Economic Decision

SEMESTER 3 - 4
Core courses: • Reading Course * • Advanced Optimisation/Games/Statistics (content of the course to be announced later) • Markov Decision Processes Elective courses. Choose 30 ECTS • Optimization (6) • Mathematics of Machine and Deep learning Algorithms (6) • Game Theory (6) • Microeconomics I (6) • Econometrics I (6) • Optimization for deep learning (3) • Advanced Topics in Artificial Intelligence** (6) • Techniques du Décisionnel et Big Data*** (3) • Non-parametric models (3) • Survey sampling (3) • Stochastic Optimal control in economics (6) • Econometrics II (6) • Big Data (6) • Microeconomics II (6) • Economic Theory (6) • Topics in Econometrics and empirical economics (6) • Capital Markets (6) • Corporate Finance: Theory and Empirics (6) • High-Dimensional Models (3) • Topics in MED **** Mandatory: • Master thesis or Internship
Non-Mandatory: • Algebra Refresher • Probability Refresher • Dynamic Optimization Refresher • Economics refresher • Statistical Software : R • Statistical Software : Python

* Each student is supervised by a professor who assigns him/her with reading assignments at the graduate and research level.

** 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 (subject to validation by the Master's supervisor):

- Possibility to follow an advanced course (see <https://www.tse-fr.eu/fr/groups/mathematiques-de-la-decision-et-statistique?tabs=7>)
- or Possibility to follow a course from a research school
- or Possibility to follow courses in other Master 2 programmes

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:

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