

Program 2022/2023



## Objectives

The master's program « Econometrics, Statistics » aims to give the students intending to pursue advanced professional careers or doctoral research a solid culture in economics and statistics, as well as in various related fields of applied mathematics.

The first year of the international track « Data Science for Social Sciences » offers compulsory general courses in theoretical economics, econometrics, mathematical statistics and statistical software for data scientists, as well as optional specialization courses in mathematics and their applications such as, for instance, finance, data bases, optimization, Markov chains, martingales theory, probability modeling, and big data.

The second year of this master emphasizes advanced and applied techniques in data science, statistics and econometrics. It offers deeper courses in data science, particularly in mathematics of machine and deep learning algorithms, data mining, big data, regulation of data spreading and data protection, as well as specialized courses in different fields of application of statistics to social sciences, such as spatial statistics and econometrics, graph theory and graph analytics, geomarketing, scoring, and web mining. Moreover, this second year of the program offers higher level courses of statistical software, namely R, Python and SAS, and of massive databases management. The different courses allow students to acquire versatile skills in the processing of complex data (panel, survey, survival, graph, spatial) with modern parametric, non-parametric, and learning statistical methods.

This international track aims to train "data scientists", "data analysts", "project managers", "engineers" and/or "consultants" in statistics with backgrounds in economics and econometrics. The graduates benefit from direct professional integration not only in the tertiary sector (e.g. quantitative marketing, banking, insurance), but also in industry and academic research.

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

## First year courses – Data Science for Social Sciences (Initial training)

SEMESTRE 1	SEMESTRE 2
<p><b>Compulsory courses:</b></p> <ul style="list-style-type: none"> <li>• Mathematical Statistics 1 *</li> <li>• Statistical Software for Data Scientists (R, Python, SAS)*</li> <li>• Intermediate Econometrics *</li> <li>• Applied Econometrics*</li> <li>• Game Theory*</li> <li>• Professional Development</li> <li>• FLE</li> </ul>	<p><b>Compulsory courses:</b></p> <ul style="list-style-type: none"> <li>• Mathematical Statistics 2*</li> <li>• Applied Econometrics*</li> <li>• Program Evaluation*</li> <li>• FLE</li> </ul>
<p><b>2 electives from:</b></p> <ul style="list-style-type: none"> <li>• Environmental Economics</li> <li>• Economic History</li> <li>• Markov Chains and Applications</li> <li>• Probability Modelling</li> <li>• Evolution of Economic Behaviour</li> <li>• Project management</li> <li>• Optimization</li> <li>• Understanding real world Organizations</li> <li>• Market Power &amp; Regulation</li> </ul>	<p><b>4 electives from:</b></p> <ul style="list-style-type: none"> <li>• Industrial Organization**</li> <li>• Environmental &amp; Resource Economics**</li> <li>• Economics of Human Development**</li> <li>• Corporate Finance**</li> <li>• Market Finance**</li> <li>• Dynamic Optimization</li> <li>• Introduction to Big Data**+</li> <li>• Martingales Theory and Applications</li> <li>• Time series**</li> <li>• Data Bases **</li> <li>• Optimization for big data**+</li> </ul>

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

\*\* Highly suggested by a M2 director:

- 'Introduction to big data' or 'Optimization for big data' or 'Data bases' or 'Times series': M2 Statistics and Econometrics
- Industrial Organization: M2 EMO
- Environmental & Resource Economics: M2 ERNA
- Economics of human development: M2 PPD
- Corporate Finance and Market Finance: M2 Finance
- Time Series and/or Panel Data: M2 EEE

\*\*\* Math camp for M1 and M2 students

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

## Second year courses – Data Science for Social Sciences (Initial training)

SEMESTRE 1	SEMESTRE 2
<p><b>Compulsory:</b></p> <ul style="list-style-type: none"> <li>• Scoring</li> <li>• Data Mining</li> <li>• Mathematics of Machine and Deep Learning Algorithms</li> <li>• Statistical Consulting*</li> <li>• Statistical Software: SAS, R, Python and Excel</li> <li>• Communication or French as a Foreign language (FLE)</li> <li>• Non-parametric Models</li> <li>• Survey Sampling</li> </ul> <p><b>1 among 3 :</b></p> <ul style="list-style-type: none"> <li>• Datanomics : regulation of data spreading and data protection</li> <li>• Project management**</li> <li>• Ethics of social studies</li> </ul>	<p><b>Compulsory:</b></p> <ul style="list-style-type: none"> <li>• Big Data</li> <li>• Graph Analysis</li> <li>• Extreme risk Analysis</li> <li>• Spatial Econometrics</li> <li>• Data Bases</li> <li>• Web Mining</li> <li>• Optimization for deep learning</li> </ul>
<p><b>Optional:</b></p> <ul style="list-style-type: none"> <li>• Algebra Refresher***</li> <li>• Probability Refresher***</li> <li>• Dynamic Optimization Refresher***</li> <li>• Professional Development**</li> </ul>	<p><b>Internship of master thesis</b></p>

*\*Groups of 4 students*

*\*\* Students who have attended the course in 2021/2022 are exempted*

*\*\*\* Maths refreshers courses for 1st and 2nd year master students (30 students max. per option)*

- **Internship:** duration typically of 6 months graded on the basis of the internship report and of the oral defense.

- **Tutored projects:** (a) the Statistical Consulting course (4 students per group) is a project proposed by a company and supervised by 2 teachers/researchers, with a report to be delivered to the client before the final defense; (b) collective projects (2 to 4 students per group) for several courses (e.g., Survey sampling, Non-parametric models, and Spatial Econometrics) supervised by a teacher, with a final oral defense.

- **Master thesis** (alternative option to the internship): topic of your choice supervised by a teacher or a researcher, with a final oral defense in M2 and without defense in M1.

## Second year courses – Data Science for Social Sciences (Alternance)

SEMESTRE 1	SEMESTRE 2
<p><b>Compulsory:</b></p> <ul style="list-style-type: none"> <li>• Scoring</li> <li>• Data Mining</li> <li>• Mathematics of Machine and Deep Learning Algorithms</li> <li>• Statistical Software: SAS, R, Python</li> <li>• Communication or French as a Foreign Language (FLE)</li> <li>• Non-parametric Models</li> <li>• Survey Sampling</li> </ul>	<p><b>Compulsory:</b></p> <ul style="list-style-type: none"> <li>• Big Data</li> <li>• Graph Analysis</li> <li>• Extreme Risk Analysis</li> <li>• Spatial Econometrics</li> <li>• Data Bases</li> <li>• Web Mining</li> <li>• Optimization for Deep Learning</li> </ul>
<p><b>Optional:</b></p> <ul style="list-style-type: none"> <li>• Algebra Refresher*</li> <li>• Probability Refresher*</li> <li>• Dynamic Optimization Refresher*</li> <li>• Professional Development**</li> <li>• Datanomics : Regulation of Data Spreading and Data Protection</li> </ul>	<p><b>Rapport d'activité</b></p>

\* Maths refreshers courses for 1st and 2nd year master students (30 students max. per option)

\*\* Students who have attended the Professional Development/Coaching course in 2021/2022 are exempted

- Students with an undergraduate degree who majored in Economics or Economics and Mathematics at the Toulouse School of Economics, and who are 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 "Data Science for Social Sciences", international track entirely taught in English.
- Or by application review:
  - Students with an undergraduate degree in an economics or mathematics field;
  - French or foreign students with a degree and credits considered equivalent, and who are able to justify a good English level (TOEFL, IELTS or Cambridge English Advanced Certificate C1 level required) as well as a good Mathematics Level (GRE required for foreign students).

## Second year - Acceptance criteria and enrollment

- Students majored in the M1 program "Data Science for Social Sciences" are eligible to enroll in the M2 program.
- Or by application review:
  - Holders of a master's degree in an economics or mathematics field;
  - Students holding diplomas or credits, French or foreign, deemed equivalent, and able to certify a good English level (TOEFL, IELTS or Cambridge English Advanced Certificate C1 level required) as well as a good Mathematics Level (GRE required for foreign students).

## Application Process

Applications are considered in November for Eiffel scholarships applicants, in January for other foreign degree holders and French degree holders applying for 1<sup>st</sup> year Master only and in May for French degree holders applying for the second year. More details are available online at: <https://www.tse-fr.eu/admissions>

## Information

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 31000 Toulouse  
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 Website: [www.tse-fr.eu](http://www.tse-fr.eu)

## Administration

Email: [scoltsem1@ut-capitole.fr](mailto:scoltsem1@ut-capitole.fr) (1<sup>st</sup> year)  
 Or [scoltsem2@ut-capitole.fr](mailto:scoltsem2@ut-capitole.fr) (2<sup>nd</sup> year)  
 Admission Office: [TSE-admissions@ut-capitole.fr](mailto:TSE-admissions@ut-capitole.fr)

## Program Directors:

- 1<sup>st</sup> year Master: Sébastien GADAT - [sebastien.gadat@tse-fr.eu](mailto:sebastien.gadat@tse-fr.eu)
- 2<sup>nd</sup> year: Abdelaati Daouia – [abdelaati.daouia@tse-fr.eu](mailto:abdelaati.daouia@tse-fr.eu)