

Presentation of the formation
Integrated Bachelor's degree Master
in **DATA SCIENCE**



Faculty of Mathematics,
Department of Probabilities-Statistics

Description of the formation



The aim of this **Master's degree program** in **Data Science** is to train specialists with great potential in this field. It aims to provide students with a **mastery** of all the mathematical and computational techniques and tools for exploiting data at every stage of the scientific process so that they are **operational** as soon as their training is completed. They should thus be able to find **optimized, innovative** solutions to the problems faced by the organizations employing them (from the most sensitive socio-economic, industrial, and strategic sectors) and thus **improve** their performance by **exploiting** the **sleepy data** available.

This **nationally-recruited**, 5-year course enables students to acquire all the knowledge they need in their field of specialization as well as definite insights into many related fields.

It is based on a core curriculum that is:

- **solid in mathematics**, providing a real understanding of the various subtleties of the theoretical models involved,
- **rich in computer science**, broadening the spectrum of available processes;
- **subtle in statistics**, facilitating the selection/use of the most appropriate data;
- **relevant in optimization**, offering a multitude of efficient methods.

The first three years, corresponding to the Bachelor's degree, provide students with :

- a coherent foundation of scientific fundamentals in mathematics and computer science;
- an introduction to randomness and optimization;
- an introduction to the basics of data science.

The last two years, corresponding to the Master's curriculum, gradually give the student, based on previous experience, the ability to:

- appropriation of the basics;
- mastery of the various tools;
- conceptual, and applicative expertise in data science.

Profiles and skills to be acquired



The objective of this training program is to ensure the development of knowledge and skills in three fundamental pillars:

Business and strategy: the program includes core courses such as strategic decision-making, data, and data visualization and communication, which enable an understanding of the business context and how to add value to strategic decision-making to help improve performance.

Statistics and machine learning: the core skill that will enable a data scientist to endure technological advances is statistics. In addition to this ability, machine learning skills are increasingly in demand. That's why the curriculum includes courses in probability theory and statistical inference regression analysis, as well as data mining and machine learning techniques and technologies. The program also includes advanced courses such as multivariate analysis, Bayesian inference, and neural networks.

Programming and database systems: skills in statistics and machine learning are complemented by those in programming and database systems. The core courses introduce students to various mathematical programming tools and the Python programming language and include program design methods, techniques, data structures, algorithms, debugging, testing and simulation, database systems and modeling, relational database management systems and architecture, and the design and implementation of database applications.

Career opportunities

Graduates of the Master's degree program in Data Science find jobs in all sectors of industry and commerce. They can create innovative startups to automate certain tasks in strategic sectors such as hydrocarbons, national security, and public administration. They can also aspire to positions as application developers in the field of data science in the following professions:

- Data scientist, data engineer, or data analyst,
- Administrator of complex data warehouses and databases,
- Application and/or massive data manager,
- Data architect,
- Big Data application designer/developer,
- Research and development engineer.
- ...

Training Program

The program is structured into four components:

- Scientific foundation (basic mathematics, computer science, programming, statistics, optimization ...);
- Specialization (data analysis, databases, machine learning ...);
- Related disciplines (artificial intelligence, operations research ...);
- Open disciplines.

Projects, in the form of practical work and internships are an important part of the training program, providing hands-on experience adapted to each level of the curriculum and each aspect of the specialty.

Backed by the MSTD (<http://lmstd.usthb.dz>) and LaROMaD (<https://laromad.usthb.dz/>) research laboratories, the program is designed to be an integral part of an industry-research partnership and can easily be opened up internationally through study visits.

	Premier semestre	Second Semestre
L1	Analysis 1, 7 ECTS Algebra 1, 6 ECTS Data structures and algorithms 1, 6 ECTS Statistics 1, 6 ECTS ICT 1, 3 ECTS English 1, 2 ECTS	Analysis 2, 7 ECTS Algebra 2, 6 ECTS Data structures and algorithms 2, 6 ECTS Statistics 2, 6 ECTS Programming tools for mathematics, 3 ECTS English 2, 2 ECTS
L2	Analysis 3, 7 ECTS Topology, 5 ECTS Algebra 3, 4 ECTS Probability 1, 5 ECTS Object-oriented programming, 3 ECTS Complexity, 4 ECTS English 3, 2 ECTS	Analysis 4, 7 ECTS Algebra 4, 4 ECTS Probability 2, 4 ECTS Databases, 4 ECTS Python programming language, 4 ECTS Operations Research 1, 5 ECTS English 4, 2 ECTS
L3	Data Mining 1, 6 ECTS Numerical analysis, 6 ECTS Nonlinear optimization, 6 ECTS Modeling and case studies, 5 ECTS Introduction to business management, 5 ECTS	Random Processes, 6 ECTS Data Mining 2, 6 ECTS Operations Research 2, 4 ECTS Polls and Surveys, 4 ECTS Project Management, 3 ECTS Information Theory, 3 ECTS Internship/Project, 4 ECTS
M1	Linear models, 5 ECTS Time series, 5 ECTS Bayesian inference, 4 ECTS Simulation, 4 ECTS Data warehouse and OLAP, 5 ECTS Multicriteria analysis, 4 ECTS Introduction to computer security, 3 ECTS	Non-parametric estimation, 6 ECTS Categorical data analysis, 4 ECTS Machine learning, 4 ECTS Distributed database systems, 4 ECTS Data science programming and software, 4 ECTS Multimedia information extraction, 4 ECTS Metaheuristics, 4 ECTS
M2	Advanced machine learning, 8 ECTS Databases and big data, 4 ECTS Graphical models, 6 ECTS Code theory and applications, 5 ECTS Decision trees, 4 ECTS Finance, 3 ECTS	Final Year Project, 30 ECTS

Access conditions

- **Priority 01** : Baccalaureate in Mathematics,
- **Priority 02** : - Baccalaureate in Expérimental Sciences,
- Baccalaureate in Mathématique Techniques.

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