



## ANNEX A: STUDY PLAN

The MSc in Data Science and Scientific Computing has 2 curricula:

- Curriculum “Data Science”
- Curriculum “Computational Science and Engineering”

### Curriculum “Data Science”

The curriculum in Data Science trains experts in data management and analysis, with a special focus on Big Data. Students will acquire skills on statistics, modelling, data analytic, high performance computing and management of databases for big data.

Curriculum “Data Science”			
I year (60 ECTS)			
Course	SSD	TAF	ETCS
Advanced Programming and Algorithmic Design	ING-INF/05	B	12
Foundations of High Performance Computing	ING-INF/05	B	9
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6
Numerical Analysis	MAT/08	B	6
Data Management for Big Data	INF/01	B	9
Statistical Methods for Data Science	SECS-S/01	C	6
Statistical Machine Learning	INF/01	B	6
II year (60 ECTS)			
Course	SSD	TAF	ETCS
Optional courses		C	12
Free choice courses		D	12
Internship and seminar courses		F	12
Thesis		E	24



In the study plan you can enter some optional courses (TAF C) to be chosen between:

Optional Courses			
Course	SSD	TAF	ETCS
Stochastic Modelling and Simulation	INF/01	C	6
Optimisation Models	MAT/09	C	9
Computer Vision and Pattern Recognition	ING-INF/04	C	6
Network Science	INF/01	C	6
Information Retrieval	ING-INF/05	C	6
Social Network Analysis	SECS-S/05	C	6
Big Data Bioinformatics	INF/01	C	6
Genomic Data Analytics	MED/03	C	6
Cyber-Physical Systems	INF/01	C	6
Health Data Analytics	MED/01	C	6
Software Development Methods	ING-INF/05	C	6
Optimisation and Design	ING-IND/08	C	9

In the study plan you can enter some free choice courses (TAF D) that can be selected from those listed below. Please check their actual activation in the year of interest.

Free Choice Courses			
Course	SSD	TAF	ECTS
All courses of previous tables		D	
Open Data Management and the Cloud	ING-INF/05	D	6
Bayesian Statistics	SECS-S/01	D	6
Algorithms for Massive Data	INF/01	D	6
Computational and Systems Neuroscience	M-PSI/02	D	6
Management of Health Data	ING-INF/06	D	6
Biomedical Signals and Bioimage Analysis	ING-INF/06	D	6



Applied Genomics	BIO/18	D	6
Advanced Mathematical Methods	MAT/05	D	6
Advanced Numerical Analysis	MAT/08	D	6
Dynamical Systems	ING-INF/04	D	9
Control Theory	ING-INF/04	D	9
Molecular Simulation	ING-IND/24	D	9
Other courses (****) (****) They can belong to any SSD		D	



## Curriculum “Computational Science and Engineering”

The curriculum in Computational Science and Engineering forms qualified graduates in Computational Science and Engineering. The student will acquire mathematical modeling skills, knowledge of numerical simulation methods, data analytics, computational intensive computing and scientific programming.

Curriculum “Computational Science and Engineering”			
I year (60 ECTS)			
Course	SSD	TAF	ECTS
Advanced Programming and Algorithmic Design	ING-INF/05	B	12
Foundations of High Performance Computing	ING-INF/05	B	9
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6
Numerical Analysis	MAT/08	B	6
Stochastic Modelling and Simulation	INF/01	B	6
Advanced Numerical Analysis	MAT/08	B	6
Optimisation Models	MAT/09	B	9
II year (60 ECTS)			
Course	SSD	TAF	ECTS
Optional courses		C	12
Free choice courses		D	12
Internship and seminar courses		F	12
Thesis		E	24

In the study plan you can enter some optional courses (TAF C) to be chosen between:

Optional Courses			
Course	SSD	TAF	ECTS
Optimisation and Design	ING-IND/08	C	9
Dynamical Systems	ING-INF/04	C	9



Control Theory	ING-INF/04	C	9
Fluid Dynamics	ICAR/01	C	6
Computational Methods for Turbulent Fluids	ICAR/01	C	6
Advanced Mathematical Methods	MAT/05	C	6
Computational Physics Laboratory	FIS/01	C	6
Computational Quantum Chemistry	CHIM/02	C	6
Molecular Simulation	ING-IND/24	C	9
Astrophysics	FIS/05	C	6
Formation of Cosmological Large-Scale Structures	FIS/05	C	9
Statistical Machine Learning	INF/01	C	6
Cyber-Physical Systems	INF/01	C	6
Software Development Methods	ING-INF/05	C	6

In the study plan you can enter some free choice courses (TAF D) that can be selected from those listed below. Please check the actual activation of the courses in the year of interest.

Free Choice Courses			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>ECTS</i>
All courses of previous tables		D	
Data Management for Big Data	INF/01	D	9
Network Science	INF/01	D	6
Statistical Methods for Data Science	SECS-S/01	D	6
Big Data Bioinformatics	INF/01	D	6
Open data management and the cloud	ING-INF/05	D	6
Information Retrieval	ING-INF/05	D	6
Bayesian Statistics	SECS-S/01	D	6
Social Network Analysis	SECS-S/05	D	6
Algorithms for Massive Data	INF/01	D	6
Computational and Systems Neuroscience	M-PSI/02	D	6



Computer Vision and Pattern Recognition	ING-INF/04	D	6
Computational Fluid Mechanics	ING-IND/10	D	6
Biofluidodynamics	ING-IND/34	D	9
Environmental Hydraulics	ICAR/01	D	6
Statistical Mechanics	CHIM/02	D	6
Physics of Atmosphere	FIS/06	D	6
Oceanography	GEO/12	D	6
Theoretical Astrophysics	FIS/05	D	6
Numerical Methods in Quantum Mechanics	FIS/03	D	6
Simulation of Multibody Systems	FIS/03	D	6
Genomic Data Analytics	MED/03	D	6
Health Data Analytics	MED/01	D	6
Biomedical Signals and Bioimage analysis	ING-INF/06	D	6
Other courses (****) (****) They can belong to any SSD		D	



### Curriculum “Data Science” lasting 3 years for part-time students

This section contains a recommended subdivision of the Data Science curriculum for part-time students, who choose a three-year program. Subdivisions and study plans different from the following one can be presented by the students and are subject to the approval by the Faculty Committee.

<b>Curriculum “Data Science” 3-years part-time</b>			
<b>I year (39 ECTS)</b>			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>ECTS</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6
Data Management for Big Data	INF/01	B	9
Statistical Methods for Data Science	SECS-S/01	C	6
<b>II year (39 ECTS)</b>			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>ECTS</i>
Foundations of High Performance Computing	ING-INF/05	B	9
Numerical Analysis	MAT/08	B	6
Statistical Machine Learning	INF/01	B	6
Optional courses		C	12
Free choice courses		D	6
<b>III year (42 ECTS)</b>			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>ECTS</i>
Free choice courses		D	6
Internship and seminar courses		F	12
Thesis		E	24



## Curriculum “Data Science” lasting 4 years for part-time students

This section contains a recommended subdivision of the Data Science curriculum for part-time students, who choose a four-year program. Subdivisions and study plans different from the following one can be presented by the students and are subject to the approval by the Faculty Committee.

Curriculum “Data Science” 4-years part-time			
I year (33 ECTS)			
Course	SSD	TAF	ECTS
Advanced Programming and Algorithmic Design	ING-INF/05	B	12
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6
Data Management for Big Data	INF/01	B	9
II year (27 ECTS)			
Course	SSD	TAF	ECTS
Foundations of High Performance Computing	ING-INF/05	B	9
Numerical Analysis	MAT/08	B	6
Statistical Methods for Data Science	SECS-S/01	C	6
Statistical Machine Learning	INF/01	B	6
III year (30 ECTS)			
Course	SSD	TAF	ECTS
Optional courses		C	12
Free choice courses		D	12
Internship and seminar courses		F	6
IV year (30 ECTS)			
Course	SSD	TAF	ECTS
Internship and seminar courses		F	6
Thesis		E	24

**Remark:** SSD is an italian categorization of scientific disciplines, which is alternative to ERC one, and is mainly used in academic staff recruitment. Check [this web page](#) for a translation of SSDs in English. [Here](#) you can find an explanation of the italian grading system in the university.