



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	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
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	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			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>
Stochastic Modelling and Simulation	INF/01	C	6
Optimisation Models	MAT/09	C	9
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, or from any course available in the university of Trieste, provided its compatibility with the training program. Please check the actual activation of the following courses in the year of interest.

Free Choice Courses			
<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>
All courses of previous tables		D	
Open Data Management and the Cloud	ING-INF/05	D	6
Computer Vision and Pattern Recognition	ING-INF/05	D	6
Bayesian Statistics	SECS-S/01	D	6
Algorithms for Massive Data	INF/01	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
Systems and Control Theory	ING-INF/04	D	9
Optimal and Robust Control	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 anYearno (60 ECTS)			
Course	SSD	TAF	CFU
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	CFU
Optimisation and Design	ING-IND/08	C	9
Systems and Control Theory	ING-INF/04	C	9
Optimal and Robust Control	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, or from any course available in the university of Trieste, provided its compatibility with the training program. Please check the actual activation of the following courses in the year of interest.

Free Choice Courses			
Course	SSD	TAF	CFU
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
Computer Vision and Pattern Recognition	ING-INF/05	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	

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: goo.gl/nKX15c.

Here you can find an explanation of the italian grading system in the university: goo.gl/PYVFTC



ANNEX B: SPECIALIZATIONS AND PROPOSED STUDY PLANS

Curriculum: Data Science

Specialization in Data Science for Healthcare

I Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Data Management for Big Data	INF/01	B	9	II
Statistical Methods for Data Science	SECS-S/01	C	6	II
Statistical Machine Learning	INF/01	B	6	II

II Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Health Data Analytics	MED/01	C	6	II
Software Development Methods	ING-INF/05	C	6	I
Management of Health Data	ING-INF/06	D	6	I
<i>At least 6 CFU between</i>				
Biomedical Signals and Bioimage Analysis	ING-INF/06	D	6	I
Information Retrieval	ING-INF/05	C	6	II
Computer Vision and Pattern Recognition	ING-INF/05	D	6	I
Optimization Models	MAT/09	C	9	II
Open Data Management and the Cloud	ING-INF/05	D	6	I



Curriculum: Data Science

Specialization in Data Science for Life Sciences

I Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Data Management for Big Data	INF/01	B	9	II
Statistical Methods for Data Science	SECS-S/01	C	6	II
Statistical Machine Learning	INF/01	B	6	II

II Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Genomic Data Analytics	MED/03	C	6	II
Big Data Bioinformatics	INF/01	C	6	I
Applied Genomics	BIO/18	D	6	I
<i>At least 6 CFU between</i>				
Algorithms for Massive Data	INF/01	D	6	II
Stochastic Modelling and Simulation	INF/01	C	6	II
Molecular Simulation	ING-IND/24	C	9	I



Curriculum: Data Science

Specialization in Data Science for Social Sciences

I Year

Course	SSD	TAF	CFU	SEM
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Data Management for Big Data	INF/01	B	9	II
Statistical Methods for Data Science	SECS-S/01	C	6	II
Statistical Machine Learning	INF/01	B	6	II

II Year

Course	SSD	TAF	CFU	SEM
Network Science	INF/01	C	6	I
Social Network Analysis	SECS-S/05	C	6	II
Information Retrieval	ING-INF/05	C	6	II
<i>At least 6 CFU (12 TAF D) between</i>				
Bayesian Statistics	SECS-S/01	D	6	II
Stochastic Modelling and Simulation	INF/01	C	6	II
Optimisation Models	MAT/09	C	9	II



Curriculum: Data Science

Specialization in Foundations of Data Science

I Year

Course	SSD	TAF	CFU	SEM
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Data Management for Big Data	INF/01	B	9	II
Statistical Methods for Data Science	SECS-S/01	C	6	II
Statistical Machine Learning	INF/01	B	6	II

II Year

Course	SSD	TAF	CFU	SEM
Software Development Methods	ING-INF/05	C	6	I
<i>At least 6 CFU between</i>				
Information Retrieval	ING-INF/05	C	6	II
Network Science	INF/01	C	6	I
<i>At least 12 CFU (different course than those already selected) between</i>				
Information Retrieval	ING-INF/05	C	6	II
Network Science	INF/01	C	6	I
Computer Vision and Pattern Recognition	ING-INF/05	D	6	I
Bayesian Statistics	SECS-S/01	C	6	II
Open Data Management and the Cloud	ING-INF/05	D	6	I
Algorithms for Massive Data	INF/01	D	6	II
Optimisation Models	MAT/09	C	9	II
Stochastic Modelling and Simulation	INF/01	C	6	II
Cyber-Physical Systems	INF/01	C	6	II



Curriculum: Data Science

Specialization in Data Engineering

I Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Data Management for Big Data	INF/01	B	9	II
Statistical Methods for Data Science	SECS-S/01	C	6	II
Statistical Machine Learning	INF/01	B	6	II

II Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Software Development Methods	ING-INF/05	C	6	I
Network Science	INF/01	C	6	I
Open Data Management and the Cloud	ING-INF/05	D	6	I
<i>At least 6 CFU between</i>				
Information Retrieval	ING-INF/05	C	6	II
Computer Vision and Pattern Recognition	ING-INF/05	D	6	I
Bayesian Statistics	SECS-S/01	C	6	II



Curriculum: Computational Science and Engineering

Specialization in Computational Fluid Dynamics

I Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Stochastic Modelling and Simulation	INF/01	B	6	II
Advanced Numerical Analysis	MAT/08	B	6	II
Optimisation Models	MAT/09	B	9	II

II Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Fluid Dynamics	ICAR/01	C	6	I
Computational Methods for Turbulent Fluids	ICAR/01	C	6	II
Advanced Mathematical Methods	MAT/05	C	6	I
<i>At least 6 CFU between</i>				
Software Development Methods	ING-INF/05	C	6	I
Biofluidodynamics	ING-IND/34	D	9	I
Environmental Hydraulics	ICAR/01	D	6	I
Physics of Atmosphere	FIS/06	D	6	II
Oceanography	GEO/12	D	6	II
Computational Fluid Mechanics	ING-IND/10	D	6	II



Curriculum: Computational Science and Engineering

Specialization in Computational Physics

I Year

Course	SSD	TAF	CFU	SEM
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Stochastic Modelling and Simulation	INF/01	B	6	II
Advanced Numerical Analysis	MAT/08	B	6	II
Optimisation Models	MAT/09	B	9	II

II Year

Course	SSD	TAF	CFU	SEM
Computational Physics Laboratory	FIS/01	C	6	II
<i>At least 6 CFU (TAF C) between</i>				
Molecular Simulation	ING-IND/24	C	9	I
Fluid Dynamics	ICAR/01	C	6	I
<i>At least 12 CFU (TAF D) between</i>				
Numerical Methods in Quantum Mechanics	FIS/03	D	6	II
Simulation of Multibody Systems	FIS/03	D	6	II
Physics of Atmosphere	FIS/06	D	6	II
Computational Quantum Chemistry	CHIM/02	C	6	II
Fluid Dynamics	ICAR/01	C	6	I
Molecular Simulation	ING-IND/24	C	9	I
Statistical Mechanics	CHIM/02	D	6	I
Software Development Methods	ING-INF/05	C	6	I



Curriculum: Computational Science and Engineering

Specialization in Computational Cosmology

I Year

Course	SSD	TAF	CFU	SEM
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Stochastic Modelling and Simulation	INF/01	B	6	II
Advanced Numerical Analysis	MAT/08	B	6	II
Optimisation Models	MAT/09	B	9	II

II Year

Course	SSD	TAF	CFU	SEM
Astrophysics	FIS/05	C	6	I
Formation of Cosmological Large-Scale Structures	FIS/05	C	9	I
Introduction to Cosmology	FIS/05	F	1	I
Theoretical Astrophysics	FIS/05	D	6	I
<i>At least 6 CFU (TAF D) between</i>				
Computational Physics Laboratory	FIS/01	C	6	II
Simulation of Multibody Systems	FIS/03	D	6	II

This specialization is recommended only to students with a bachelor in Physics.



Curriculum: Computational Science and Engineering

Specialization in Computational Chemistry

I Year

Course	SSD	TAF	CFU	SEM
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Stochastic Modelling and Simulation	INF/01	B	6	II
Advanced Numerical Analysis	MAT/08	B	6	II
Optimisation Models	MAT/09	B	9	II

II Year

Course	SSD	TAF	CFU	SEM
Computational Physics Laboratory	FIS/01	C	6	II
Computational Quantum Chemistry	CHIM/02	C	6	II
Molecular Simulation	ING-IND/24	C	9	I
<i>At least 6 CFU (TAF D) between</i>				
Numerical Methods in Quantum Mechanics	FIS/03	D	6	II
Simulation of Multibody Systems	FIS/03	D	6	II
Statistical Mechanics	CHIM/02	D	6	I
Software Development Methods	ING-INF/05	C	6	I



Curriculum: Computational Science and Engineering

Specialization in Control and Design of Cyber-Physical Systems

I Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Advanced Programming and Algorithmic Design	ING-INF/05	B	12	I+II
Foundations of High Performance Computing	ING-INF/05	B	9	I
Machine Learning and Data Analytics	ING-INF/05 SECS-S/01	B C	6 6	I
Numerical Analysis	MAT/08	B	6	I
Stochastic Modelling and Simulation	INF/01	B	6	II
Advanced Numerical Analysis	MAT/08	B	6	II
Optimisation Models	MAT/09	B	9	II

II Year

<i>Course</i>	<i>SSD</i>	<i>TAF</i>	<i>CFU</i>	<i>SEM</i>
Systems and Control Theory	ING-INF/04	C	9	I
Optimal and Robust Control	ING-INF/04	C	9	II
Cyber-Physical Systems	INF/01	C	6	II
<i>At least 6 CFU between</i>				
Optimisation and Design	ING-IND/08	C	6	I
Statistical Machine Learning	INF/01	C	6	II
Software Development Methods	ING-INF/05	C	6	I