

**Plan of studies**  
**3-5-8**

**2023/24**

**2023/  
24**





---

# **Plan of studies**

## **3-5-8**

### **2023/24**



---

# Index

---

<b>Preface</b>		9
<hr/>		
<b>Academic Calendar</b>		13
<hr/>		
<b>Organisational Structure, Administration and Services</b>	Faculty of Informatics	17
	Faculty's executive bodies	18
	Faculty's governing bodies	20
	Research institutes	22
	Rectorate, Administration and Services	25
<hr/>		
<b>Bachelor</b>	Bachelor	33
<hr/>		
<b>Master</b>	Introduction	37
	Informatics	39
	Artificial Intelligence	44
	Computational Science	47
	Financial Technology and Computing	50
	Management and Informatics	54
Software and Data Engineering	58	
<hr/>		
<b>PhD</b>	PhD	63
<hr/>		



---

## Preface





Informatics is everywhere. Its impact on our everyday lives is already profound, and its reach will only deepen in the future. It is a discipline that is at the heart of today's information society, made possible by over half a century of rigorous research. Yet it also faces incredible challenges: How can we ensure that airplanes and nuclear reactors are not failing due to errors in their programming? How can we protect critical infrastructure such as hospitals and water supply plants from hackers? How do we spot and remove bias in automated systems such as credit scoring and predictive policing? And will recent advances in artificial intelligence lead to a "super-intelligence" that will eventually take over the world?

All this is ultimately governed by countless ones and zeros, the "bits" that instructs computers what to do. Informatics is the science of representing, organizing, storing, accessing, communicating, and processing these bits – i.e., information – using a universal language and a powerful formalism to describe and analyse problems and solutions. It brings together mathematics, physics, engineering, but also psychology, sociology, and design, in order to describe and automate processes with the help of computers. Informatics is a mix of imagination and skills, and also a sense of beauty. And it is absolutely fascinating!

Informatics is our passion. The Faculty of Informatics is home to a diverse group of excellent researchers and dedicated teachers. It is ranked consistently among the top computer science departments in Europe and – according to a recent study by Stanford University – features over a dozen "World's Top-2%" scientists. Faculty members are engaged in several national and international research projects, and we offer a full curriculum that includes Bachelor, Master, and PhD programmes, all taught in English. The Faculty strives to offer an enthusiastic, exciting, and vibrant environment for students and researchers, and we very much look forward to welcoming you!

Prof. Marc Langheinrich  
Dean of the Faculty of Informatics



---

## Academic Calendar



The academic year goes from September until June. Courses are held from September until December and from February until June. The semester includes 3 exam sessions (January, June and September).

<b>Autumn semester 2023/24</b>	Matriculation	04-22.09.2023
	Courses start	18.09.2023
	Holidays All Saints' Day Immaculate Conception	• 01.11.2023 • 08.12.2023
	Courses end	22.12.2023
<b>Exam sessions</b>	Winter session Bachelor and Master	08.01-02.02.2024
<b>Spring semester 2024</b>	Courses start	19.02.2024
	Easter holidays	29.03-07.04.2024
	Dies academicus	04.05.2024
	Holidays Saint Joseph's Day Labour Day Ascension Day Whit Monday Corpus Christi	• 19.03.2024 • 01.05.2024 • 09.05.2024 • 20.05.2024 • 30.05.2024
	Courses end	31.05.2024
<b>Exam sessions</b>	Summer session Bachelor and Master	03-28.06.2024
	Autumn session Bachelor and Master	26.08-13.09.2024



---

# **Organisational Structure, Administration and Services**





Established in October 2004, USI's Faculty of Informatics is dedicated to high quality teaching and research. The mission of the Faculty is to conduct research and produce results in the field of informatics and to equip students with creative problem-solving skills that enable them to address complex problems in business and society.

The Faculty features eight main areas of research, namely: Software Engineering, Computer Systems, Computational Science, Geometric and Visual Computing, Information Systems, Intelligent Systems, Programming Languages, and Theory and Algorithms. The Faculty is host to five institutes: the Institute of Computing (CI), the Software Institute (SI), the Computer Systems Institute (SYS), the Euler Institute (EUL) and the Dalle Molle Institute for Artificial Intelligence (IDSIA). It is also home to the affiliated Institute of Solar Physics Research (IRSOL) in Locarno.

Teaching excellence is assured by an international faculty, low student/academic staff ratio and a modern, innovative curriculum. The tuition language in the Faculty is English. The undergraduate programme is project-based and comprises six semesters of highly integrated courses and team-oriented projects. For graduate students, the Faculty offers several specialized Master's programmes (two of which in cooperation with the Faculty of Economics) and a research-oriented PhD programme. The PhD programme is highly selective and gives students the opportunity to participate in national and international research projects.

The Faculty has an active network of research partnerships with other Swiss and international centres. The national and international networks support research collaborations and student mobility.

---

## Faculty's Executive Bodies

### **Faculty of Informatics**

Lugano East Campus

tel + 41 58 666 4690

e-mail [decanato.inf@usi.ch](mailto:decanato.inf@usi.ch)

### **Dean**

Prof. Marc Langheinrich

e-mail [dean.inf@usi.ch](mailto:dean.inf@usi.ch)

The Dean is available for meetings by appointment.

### **Dean's Office & Student Administration**

Elisa Larghi (coordinator)

Arianna Bellanca (student affairs)

Sabrina Brambilla (business travel desk)

Nadia Ruggiero (exams and student affairs)

office East Campus, Office D0.07

tel + 41 58 666 4690

fax + 41 58 666 4536

e-mail [decanato.inf@usi.ch](mailto:decanato.inf@usi.ch)

[bookings.inf@usi.ch](mailto:bookings.inf@usi.ch)

Reception hours 09.15-12.30

### **Coordinator of Faculty activities and projects, and external relations**

Ing. Mauro Prevostini

**Bachelor in Informatics**

Prof. Laura Pozzi

**Master in Informatics**

Prof. Kai Hormann

Prof. Evanthia Papadopoulou

**Master in Artificial Intelligence**

Prof. Luca Maria Gambardella

Prof. Piotr Didyk

**Master in Computational Science**

Prof. Olaf Schenk

Prof. Ernst Wit

**Master in Financial Technology and Computing**

Prof. Marc Langheinrich

Prof. Fernando Pedone

**Master in Management & Informatics**

Prof. Marc Langheinrich

**Master in Software and Data Engineering**

Prof. Cesare Pautasso

Prof. Gabriele Bavota

**PhD programme Director**

Prof. Walter Binder

Prof. Stefan Wolf

**Delegate for International Relations**

To be elected

**Delegates for Student Affairs**

Prof. Gabriele Bavota

Prof. Olaf Schenk

**Delegate for Innovation and Corporate Relations**

Prof. Antonio Carzaniga

**Delegate for Continuing Education**

To be elected

**Delegates for Equal Opportunity**

Prof. Natasha Sharygina

Prof. Michael Multerer

**USI Ethics Committee, Subject Matter Experts Informatics**

Prof. Silvia Santini

Prof. Illia Horenko

The programme directors and delegates are available by appointment.

# Faculty's Governing Bodies

The Faculty's governing bodies include: the Faculty Council, the Professors Council, and the Dean's Office.

## Faculty Council

The highest body of the Faculty is the Faculty Council. It comprises:

- all tenured professors (full and associate), the assistant professors, adjunct and titular professors of the Faculty;
- one teacher representative (with one- or two-year contract),
- one post-doctoral researcher representative, one PhD student representative and one student representative (Bachelor and Master)

## Full professors

Cesare Alippi	Cesare Pautasso
Walter Binder	Fernando Pedone
Antonio Carzaniga	Mauro Pezzè
Fabio Crestani	Igor Pivkin
Patrick Eugster	Laura Pozzi
Luca Maria Gambardella	Olaf Schenk
Kai Hormann	Natasha Sharygina
Rolf Krause	Paolo Tonella
Marc Langheinrich	Ernst Wit
Michele Lanza	Stefan Wolf
Evanthia Papadopoulou	

## Associate professors

Gabriele Bavota  
Piotr Didyk  
Carlo A. Furia  
Matthias Hauswirth  
Silvia Santini

## Assistant professors

Michael Multerer

<b>Adjunct professors</b>	Svetlana Berdyugina Michael Bronstein Andrea-Emilio Rizzoli Robert Soulé
<b>Titular professors</b>	Monica Landoni
<b>Faculty Representatives</b>	<ul style="list-style-type: none"> <li>• Students To be elected</li> <li>• PhD To be elected</li> <li>• Post-docs To be elected</li> <li>• Teachers Marco Brambilla</li> </ul>
<b>Senate Representatives</b>	<ul style="list-style-type: none"> <li>• Faculty Monica Landoni Michael Multerer Paolo Tonella</li> <li>• Assistants Andrea Rosà (incoming)</li> <li>• Students Roberto Palmieri (Diell Kryeziu)</li> <li>• Administration Mauro Prevostini</li> </ul>
<b>Professors Council</b>	The Professors Council is made up of all tenured professors (full and associate) of the Faculty.
<b>Dean's Office</b>	<p>The current Dean is Prof. Marc Langheinrich.</p> <p>The current Vice-Deans are Prof. Ernst Wit and Prof. Carlo A. Furia.</p> <p>For the specific duties of each body please refer to the Statute of the Faculty.</p>

## **Institute of Computing CI**

Human thinking and decision making are transformed by unprecedented advances in mathematics, software and computer hardware. Computing has revolutionized our intellectual capacity to tackle complex problems and it is transforming the arts, sciences and every aspect of our society. Computing assists our commute, the storage and processing of our Data and it is instrumental in our efforts to analyze the Human Genome, to project Climate change and analyze the evolution of our Society. Computing is part of our everyday life and it has become indispensable for our efforts to overcome the complexity of our Information age. Simply put: Computing is essential for human evolution and survival.

The Institute of Computing at USI fosters a synergistic advancement of various components of computing. It will co-evolve multiple computing modes and advance mathematics, algorithms and software to address the challenges presented by scientific and societal problems. There is urgency across disciplines for developing and harnessing such new modes of computing. We envision that we will provide the foundations of this new form of computational thinking and, at the same, time tools to assist in projecting simulations and data science and its effects on humanity as well as extracting structure from massive amounts of Data as they emerge across our Society.

Director  
of CI

- Prof. Ernst Wit  
[www.ci.inf.usi.ch](http://www.ci.inf.usi.ch)

## **Software Institute SI**

The Software Institute (SI) is part of the Faculty of informatics of the Università della Svizzera italiana (USI), located in beautiful Lugano, in Southern Switzerland. At the SI, our strength is discovering, designing, and developing new ideas that ease the conception of modern software systems. Our research is rooted both in sound theoretical models as well as practical, real-life questions that impact modern society, a society where reliable, well engineered software systems have become quintessential. The SI is a center of

excellence committed to the teaching, the research and the development of software. The SI is directed by Michele Lanza and features renowned software researchers among its members: Profs. Gabriele Bavota (Software Analytics & Empirical Software Engineering), Matthias Hauswirth (Software Performance), Cesare Pautasso (Software Architecture & Web Engineering), Carlo Alberto Furia (Software Engineering, Formal Methods & Verification), and Paolo Tonella (Software Testing).

Director  
of SI

- Prof. Michele Lanza  
[www.si.usi.ch](http://www.si.usi.ch)

### **Computer Systems Institute SYS**

Computer systems (“systems”) encompass all areas of computer science directly related to (or having an impact on) the design, architecture, development, deployment, and operation of software and hardware systems. Topics of interest include, e.g., operating systems, networking, distributed systems, security and privacy, real-time systems, cloud computing, data management, programming languages, middleware, ubiquitous computing, embedded systems, computer architecture, and a wide range of applications. Historically, these areas have existed independently, but the increased complexity of computing artifacts increasingly requires collaborative efforts from multiple points of view to address relevant problems.

The primary goal of the Computer Systems Institute (SYS) is to develop and promote world-class research and teaching in the area of systems. Institute members have a strong presence in the community (e.g., steering and program committees of prestigious conferences, editorial boards, and collaborations with major companies) and actively participate in major national and international research efforts (e.g., SNSF, InnoSuisse, EU, industry-sponsored initiatives). The institute also plays a major role in the Bachelor and Master educational programs (e.g., teaching roughly 30% of the core courses in the Bachelor curriculum of the Faculty of Informatics, and offering two interdisciplinary Master programs in collaboration with the Faculty of Economics).

Director  
of SYS

- Prof. Patrick Eugster  
<https://sys.inf.usi.ch>

### **Euler Institute EUL**

Human thinking and decision making are transformed by unprecedented advances in mathematics, software and computer hardware. Computing has revolutionized our intellectual capacity to tackle complex problems and it is transforming the arts, sciences and every aspect of our society. Computing assists our commute, the storage and processing of our Data and it is instrumental in our efforts to analyze the Human Genome, to project Climate change and analyze the evolution of our Society. Computing is part of our everyday life and it has become indispen-

sable for our efforts to overcome the complexity of our Information age. Simply put: Computing is essential for human evolution and survival.

The Institute of Computing at USI fosters a synergistic advancement of various components of computing. It will co-evolve multiple computing modes and advance mathematics, algorithms and software to address the challenges presented by scientific and societal problems. There is urgency across disciplines for developing and harnessing such new modes of computing. We envision that we will provide the foundations of this new form of computational thinking and, at the same, time tools to assist in projecting simulations and data science and its effects on humanity as well as extracting structure from massive amounts of Data as they emerge across our Society.

Director  
of EUL

- Prof. Rolf Krause  
[www.euler.usi.ch](http://www.euler.usi.ch)

**IDSIA**  
**Istituto Dalle**  
**Molle di Studi**  
**sull'Intelligenza**  
**Artificiale**

Joint  
USI-SUPSI  
institute

IDSIA was founded in Lugano in 1988 by Angelo Dalle Molle (1908-2002), an Italian philanthropist whose vision was a world where technological progress and human development could both contribute to the improvement of our quality of life.

Dalle Molle was a precursor of electric mobility, and he established a Trustee in Switzerland to promote creative scientific research, free from the bureaucratic ties of university institutions. Nowadays the institutes founded by Angelo (IDSIA in Lugano, IDIAP in Martigny, and ISSCo in Geneva) are integrated in the local institutions.

Since the foundation of USI and SUPSI in Canton Ticino, IDSIA has been designated to be a "bridge" between these two institutions. For this reason IDSIA activities span from fundamental to applied research, transferring its knowledge into applications in the real world.

Director  
of IDSIA

- Prof. Andrea-Emilio Rizzoli  
[www.idsia.ch](http://www.idsia.ch)



## **Rectorate**

The Rectorate comprises of the Rector, the Secretary General, the Administrative Director, the Adjunct Administrative Director, and the Pro-Rectors.

A transitional phase is currently underway at the University led by the Deputy Rector, who is co-assisted by the Pro-Rectors, including an Assistant Pro-Rector.

At the same time, reorganisation is also taking place at an administrative level whereby the functions of Secretary General, Administrative Director and Deputy Administrative Director are currently carried out by a Transition Committee.

### **Rector**

Prof. Luisa Lambertini

### **Pro-Rector for Education and Students' Experience**

Prof. Lorenzo Cantoni

### **Pro-Rector for Internationalisation**

Prof. Cesare Alippi

### **Pro-Rector for Research**

Prof. Patrick Gagliardini

### **Pro-Rector for Innovation and Corporate relations**

Prof. Luca Maria Gambardella

### **Pro-Rector for Research in the Humanities and Equal Opportunities**

Prof. Sonja Hildebrand

### **Secretary General**

Giovanni Zavaritt

### **Director of Operations**

Marvin Blumer

### **Alumni**

office Main Building, Office 303  
tel + 41 58 666 4606  
e-mail [alumni@usi.ch](mailto:alumni@usi.ch)  
web [www.usi.ch/en/alumni](http://www.usi.ch/en/alumni)

### **Career Service**

office Main Building, Office 303  
tel + 41 58 666 4606  
e-mail [careerservice@usi.ch](mailto:careerservice@usi.ch)  
web [www.usi.ch/en/career](http://www.usi.ch/en/career)

### **Copy Center Onys**

office Main Building, Office 139  
tel + 41 58 666 4586  
e-mail [copycenter@usi.ch](mailto:copycenter@usi.ch)

### **Corporate identity**

office Main Building, Office 212  
tel + 41 58 666 4761  
e-mail [corporate-design@usi.ch](mailto:corporate-design@usi.ch)

### **eLearning Lab (eLab)**

office Main Building, Offices 403-406  
tel + 41 58 666 4760  
e-mail [info@elearninglab.org](mailto:info@elearninglab.org)  
web [www.elearninglab.org](http://www.elearninglab.org)

### **Equal Opportunities**

office Main Building, Office 202  
tel + 41 58 666 46 12  
e-mail [equality@usi.ch](mailto:equality@usi.ch)  
web [www.usi.ch/equality](http://www.usi.ch/equality)

### **Financial Controlling**

office Main Building, Office 221-222  
tel + 41 58 666 4518

### **Front Office**

office Main Building, Office 220  
tel + 41 58 666 4000  
e-mail [info@usi.ch](mailto:info@usi.ch)

### **Graphic design**

office Main Building, Office 210  
tel 41 58 666 4456  
e-mail [grafica@usi.ch](mailto:grafica@usi.ch)

**Housing**

office Main Building, Office 220  
tel + 41 58 666 4489  
e-mail [alloggi@usi.ch](mailto:alloggi@usi.ch)  
web [www.usi.ch/enhousing](http://www.usi.ch/enhousing)

**Human resources**

office + Main Building, Office 233-235  
e-mail [personale.lu@usi.ch](mailto:personale.lu@usi.ch)

**Institutional Communication Service**

office Main Building, Office 212  
tel 41 58 666 4792  
e-mail [press@usi.ch](mailto:press@usi.ch)

**L'ideatorio**

office Villa Saroli, Viale S. Franscini 9  
tel + 41 58 666 4520  
web [www.ideatorio.usi.ch](http://www.ideatorio.usi.ch)

**International Relations and Study Abroad Service**

office Main Building, Office 332  
tel + 41 58 666 4626  
e-mail [relint@usi.ch](mailto:relint@usi.ch)  
web [www.usi.ch/relint](http://www.usi.ch/relint)

**IT**

office + Main Building, Office 164  
tel 41 58 666 4610  
e-mail [itsupport.lu@usi.ch](mailto:itsupport.lu@usi.ch)  
web <http://usi.4me.com>

**Legal**

office + Main Building, Office 228  
tel 41 58 666 4616  
e-mail [serviziogiuridico@usi.ch](mailto:serviziogiuridico@usi.ch)

**University Library Lugano**

tel 41 58 666 4509  
e-mail + [library.lu@usi.ch](mailto:library.lu@usi.ch)  
web [www.bul.sbu.usi.ch](http://www.bul.sbu.usi.ch)

**Psychological Counselling Service**

office + [info@psicologi-ticino.ch](mailto:info@psicologi-ticino.ch)  
e-mail [www.psicologi-ticino.ch](http://www.psicologi-ticino.ch)

**Quality Assurance**

office Main Building, Office 227  
tel 41 58 666 4199  
e-mail [quality@usi.ch](mailto:quality@usi.ch)

**Research and Transfer Service**

office Main Building, Office 216/228  
tel +41 58 666 4614  
e-mail [servizio.ricerca@usi.ch](mailto:servizio.ricerca@usi.ch)  
web [www.usi.ch/en/srit](http://www.usi.ch/en/srit)

**Sport Service**

office East Campus, Office D0.07  
tel +41 58 666 4797  
e-mail [sport@usi.ch](mailto:sport@usi.ch)  
[www.sport.usi.ch](http://www.sport.usi.ch)

**Study Advisory and Promotion Service**

office Main Building, Office 303 (Level 3)  
tel +41 58 666 4795  
e-mail [studyadvisory@usi.ch](mailto:studyadvisory@usi.ch)

**USI Startup Centre**

office East Campus, Sector C  
tel +41 58 666 4140  
e-mail [startup@usi.ch](mailto:startup@usi.ch)  
web [www.startup.usi.ch](http://www.startup.usi.ch)

**Web**

office Main Building, Office 210  
tel +41 58 666 4515  
web [web@usi.ch](mailto:web@usi.ch)

**USI online  
services and  
resources**

- **Faculty course registration platform**  
<http://teaching.inf.usi.ch>
- **Faculty PhD platform**  
<https://phdprogram.inf.usi.ch>
- **eCourses platform (Moodle)**  
[www.icorsi.ch](http://www.icorsi.ch)
- **Exams, transcripts and certificates**  
[www.esami.lu.usi.ch](http://www.esami.lu.usi.ch)
- **desk.usi - Practicalities for the USI community:**  
[www.desk.usi.ch](http://www.desk.usi.ch)

**Student Corporation**

The Student Corporation is the organised structure of the University student body. This means that the sole fact that a Bachelor's or Master's student is enrolled at USI makes them a member of an umbrella organisation that is interconnected with the institutional structure of the University. The Corporation can promote activities and projects to improve students' experience on all campuses.

The Student Corporation aims to contribute to a positive and enriching student experience by strengthening the sense of community. It gives voice to the student body and gets students involved. Its name refers to the very origins of universities that were born from the union of "corporations" (called universitates) of professors and students. The Student Corporation is non-profit, non-confessional and non-political. It is inspired by the principles of democracy and equality of all its members.

More information:

[www.usi.ch/en/student-corporation](http://www.usi.ch/en/student-corporation)

**Student associations**

Several student associations have been created within the University. The main objectives are to improve relations between students and the institution and to enrich the range of educational and recreational offer during school. The associations are concerned mainly with the collection of didactic material, organisation of parties and meetings, cultural and sporting events, and networking among University students and the business world.

[www.desk.usi.ch/en/list-acknowledged-student-associations](http://www.desk.usi.ch/en/list-acknowledged-student-associations)

More information:

[www.usi.ch/en/administration-and-services](http://www.usi.ch/en/administration-and-services)



---

**Bachelor**

**BSc**





The Bachelor of Science in Informatics is structured around four areas of learning in an interdisciplinary program: theory, technology, systems thinking, and communication and teamwork.

*Theory*, which encompasses the principles and foundations of Informatics, helps the students understand the potentials and limits of computing and represents a solid basis for analysis and design.

The *technology* area covers the platforms and applications of computing. Students learn to exploit the most recent technological advances, but also to cope with technological change and evolution, and their broader impact on society.

*Systems thinking* covers the engineering of information systems within many societal, governmental, and business services. Students learn to view computer-based systems as components in a larger environment.

*Communication and Teamwork* are essential skills in information technology projects. Students learn to communicate and work with others, to coordinate and present their work.

The programme covers the foundations of Informatics. The primary objective is to provide students with a solid and broad basis for further studies in a specialization area of Informatics or in related fields, including within the application of informatics in natural and social sciences.

# Study programme

	Course	Instructor	ETCS
<b>First semester</b> 30 ETCS	Calculus	Hormann	6
	Computer Architecture	Langheinrich	6
	Programming Fundamentals 1	Furia	9
	Reason and Responsibility in Decision Making	Erez	3
	Software Atelier 1: Fundamentals of Informatics	Bavota	6
<b>Second semester</b> 30 ETCS	Algorithms & Data Structures	Carzaniga	6
	Discrete Structures	Wolf	6
	Linear Algebra	Pivkin	6
	Programming Fundamentals 2	Hauswirth	6
	Software Atelier 2: Human-Computer Interaction	Santini	6
<b>Third semester</b> 30 ETCS	Automata & Formal Languages	Pozzi	3
	Probability & Statistics	Wit	6
	Programming Fundamentals 3	Binder	6
	Systems Programming	Carzaniga	6
	Software Atelier 3: The Web	Pautasso	9
<b>Fourth semester</b> 30 ETCS	Computer Networking	Santini	6
	Data Management	Eugster	6
	Introduction to Computational Science	Multerer	3
	Operating Systems	Pedone	6
	Software Atelier 4: Software Engineering Project	Mocci	9
<b>Fifth semester</b> 30 ETCS	Algorithms & Data Structures 2	Papadopoulou	3
	Artificial Intelligence	Gambardella	3
	Computer Graphics	Didyk	6
	Experimentation & Evaluation	Bavota	6
	Information Retrieval	Crestani, Landoni	3
	Numerical Computing	Vecchi	6
Software Atelier 5: Field Project	Lanza, Prevostini	9	
<b>Sixth semester</b> 30 ETCS	Image & Video Processing	Didyk	6
	Machine Learning	Alippi	6
	Optimization Methods	Krause	6
	Quantum Computing	Wolf	6
	Theory of Computation	Sharygina	6
	Bachelor Project	Pezzè	12

---

## Masters

---



The Master's degree curricula offered by the USI Faculty of Informatics are 2-year (4 semesters) full-time graduate-level specialisation programmes, awarding 120 ECTS that complete the 3+2 model defined by the Bologna Declaration.

All programmes are defined by a high level of specialisation, opening to international careers, both in the business world and in academia. Learning is practice-oriented, with many tangible projects to be developed with the critical use of the theoretical foundations studied and the latest technologies available, in collaboration with companies and other actors in the industry, or in the context of fundamental research carried out by the Faculty. The favorable teacher-to-student ratio allows to interact directly and openly with professors considered among the top experts of their respective fields, broadening horizons and allowing to approach training in a personalized way. All this in the context of a cosmopolitan and lively Faculty, driven by a deep, authentic passion for informatics, where the desire to do and to amaze can grow and develop.

## Programmes

The Faculty offers the following programmes in the academic year 2023/24:

- Master in Informatics
- Master in Artificial Intelligence
- Master in Computational Science
- Master in Software and Data Engineering
- Master in Management and Informatics
- Master in Financial Technology and Computing

The Master in Management & Informatics and the Master in Financial Technology and Computing are offered in collaboration with USI's Faculty of Economics.

The Master in Informatics and the Master in Computational Science also offer the opportunity of obtaining a double Master's degree with a partner university.

---

A student can take part in a mobility or student exchange programme and undertake a study semester in another University for a maximum of 30 ECTS.

The student must discuss the choice of host institution and study plan with the Master director to obtain approval.

For all information about mobility please consult the International Relations and Study Abroad Service at:

[www.usi.ch/en/relint](http://www.usi.ch/en/relint)

---

4 Semesters  
120 ECTS

---

## **Informatics**

---

**Directors**

Kai Hormann, Evanthia Papadopoulou

---

**Goals and  
contents**

The Faculty of Informatics at Università della Svizzera italiana stands out as a centre of competence in informatics. In a matter of very few years, it has become one of Switzerland's major poles for teaching and research, ranking third after the two Federal Institutes of Technology in Zurich and Lausanne.

The Faculty aims to train informatics experts that are interdisciplinary in approach, with abstract thinking and generalization skills, a sound knowledge of Information technologies and their pervasive application domains, as well as project-management and teamwork abilities.

The Faculty also offers the opportunity to obtain a double Master's degree in collaboration with the University of Milano-Bicocca.

The Master prepares students for current and emerging technologies in computer science by deepening their theoretical knowledge and sharpening their practical skills. The program is designed for both Bachelor students who wish to complete their education and professionals seeking to refresh their knowledge and sharpen their skills. The Master combines the study of fundamental aspects of computer science with a practical hands-on approach, preparing professionals for successfully pursuing a career in research and development across any application domain.

The Master of Science in Informatics is characterized by a broad offering of topics and subjects that can be freely combined in a learning path tailored to the needs and interests of each student. At USI, students learn how to solve complex problems using modern computing technology. They master the ability to develop automated solutions, introduce them in different business and application domains, and predict and assess their positive impact

in the real world. Students can benefit from the research excellence of our Faculty of Informatics by getting involved in ongoing research activities as part of their master thesis project, which can be carried out across the entire second year of the Master.

### Career opportunities

Informatics is both the infrastructure and the engine of today's society. It plays a key role in industry as well as the service sector in Switzerland. The national training and research institutions have acquired a considerable reputation worldwide, in particular in the IT field. Many IT companies have or are planning to have research and development centres in Switzerland. Considering this, graduates in Informatics have excellent opportunities on the job market. The demand for well-educated specialists in Informatics is very high and is expected to grow even more.

Graduates of the Master of Science in Informatics are trained to solve complex problems in interdisciplinary areas such as machine learning, intelligent search engines, computer graphics and special effects, computer vision and face recognition, robotics, data science, and they are prepared to design, build, integrate, validate, and maintain reliable and secure software systems for the highly competitive software industry of the 21st century.

### Study plan

Students obtain a Master of Science degree in Informatics by completing the following across the two years:

- 30 out of 36 ECTS of core courses
- 30 ECTS thesis
- 60 ECTS of elective courses, 6 of which can be from non-INF USI Master programmes.

Additionally, they have the possibility to obtain a specialisation in one of the following research areas by completing 18 ECTS of electives and their master thesis in the same area:

- Artificial Intelligence
- Computer Systems
- Geometric and Visual Computing
- Information Systems
- Programming Languages
- Software Development
- Theory and Algorithms



	Course	Instructor	ETCS
<b>Autumn semester</b>			
Foundational Courses	Algorithms & Complexity	Papadopoulou	6
	Distributed Systems	Eugster	6
	High-Performance Computing	Eftekhari	6
	Machine Learning	Wand	6
	Software Design & Modeling	Furia	6
Electives*	Advanced Java Programming	Binder, Rosà	6
	Advanced Topics in Machine Learning	Alippi	6
	Artificial Intelligence	Gambardella	6
	Computer Aided Verification	Sharygina	6
	Deep Learning Lab	Vercesi	3
	Distributed Algorithms	Pedone	6
	Edge Computing in the IoT	Ferrante	6
	Mobile and Wearable Computing	Santini	6
	Numerical Algorithms	Hormann	6
	Programming Styles	Hauswirth	3
	Software performance	Hauswirth	6
	User Experience Design	Landoni, Langheinrich	6
	<b>Spring semester</b>		
Foundational Courses	Information Security	Langheinrich	6
Electives*	Advanced Computer Architectures	Pozzi	6
	Advanced Networking	Carzaniga	6
	Business Process Modeling, Management and Mining	Pautasso	3
	Computational Fabrication	Didyk	6
	Computer Vision & Pattern Recognition	Hormann	6
	Data Analytics	Crestani	6
	Geometric Algorithms	Papadopoulou	6
	Graph Deep Learning	Alippi	3
	Image & Video Processing	Wolf	3
	Information & Physics	Didyk	6
	Quantum Computing	Wolf	6
	Robotics	Giusti	6
	Security Aspects of Machine Learning	Regazzoni	3
	Software Analysis	Furia	6
	Software Architecture	Pautasso	6
	Software Quality & Testing	Pezzè	6
<b>Master thesis **</b>		Faculty	30
<b>ETCS Total</b>			120

\* Including up to 6 ECTS of electives from USI Master courses over the 2 years.

\*\* Master Thesis can be started in the 3rd semester.

	Course	Instructor	ETCS
<b>Specialisation in Artificial Intelligence</b>			
Autumn	Advanced Topics in Machine Learning	Alippi	6
	Artificial Intelligence	Gambardella	6
	Deep Learning Lab	Vercesi	3
Spring	Computer Vision & Pattern Recognition	Hormann	6
	Data Analytics	Crestani	6
	Graph Deep Learning	Alippi	3
	Robotics	Giusti	6
	Security Aspects of Machine Learning	Regazzoni	3
<b>Specialisation in Computer Systems</b>			
Autumn	Computer Aided Verification	Sharygina	6
	Distributed Algorithms	Pedone	6
	Edge Computing in the IoT	Ferrante	6
	Mobile and Wearable Computing	Santini	6
Spring	Advanced Computer Architectures	Pozzi	6
	Advanced Networking	Carzaniga	6
	Security Aspects of Machine Learning	Regazzoni	3
<b>Specialisation in Geometric and Visual Computing</b>			
Spring	Computational Fabrication	Didyk	6
	Computer Vision & Pattern Recognition	Hormann	6
	Geometric Algorithms	Papadopoulou	6
	Graph Deep Learning	Alippi	3
	Image & Video Processing	Didyk	6
<b>Specialisation in Information Systems</b>			
Autumn	Distributed Algorithms	Pedone	6
	Mobile and Wearable Computing	Santini	6
	User Experience Design	Landoni, Langheinrich	6
Spring	Advanced Networking	Carzaniga	6
	Business Process Modeling, Management and Mining	Pautasso	3
	Data Analytics	Crestani	6
<b>Specialisation in Programming Languages</b>			
Autumn	Advanced Java Programming	Binder, Rosà	6
	Computer Aided Verification	Sharygina	6
	Programming Styles	Hauswirth	3
	Software Performance	Hauswirth	3
Spring	Advanced Computer Architectures	Pozzi	6
	Software Analysis	Furia	6

	Course	Instructor	ETCS
<b>Specialisation in Software Development</b>			
Autumn	Computer Aided Verification	Sharygina	6
	Mobile and Wearable Computing	Santini	6
	Programming Styles	Hauswirth	3
	Software Performance	Hauswirth	6
Spring	Software Analysis	Furia	6
	Software Architecture	Pautasso	6
	Software Quality & Testing	Pezzè	6
<b>Specialisation in Theory and Algorithms</b>			
Autumn	Computer Aided Verification	Sharygina	6
	Numerical Algorithms	Hormann	6
Spring	Geometric Algorithms	Papadopoulou	6
	Information & Physics	Wolf	3
	Quantum Computing	Wolf	6

4 Semesters  
120 ECTS

## Artificial Intelligence

**Directors** Luca Maria Gambardella, Piotr Didyk

**Goals and contents** Artificial Intelligence (AI) is one of the most popular areas in computer science and engineering. In this master programme a wide variety of techniques will be taught, including intelligent robotics, artificial deep neural networks, machine learning, meta-heuristics optimization techniques, data mining, data analytics, simulation and distributed algorithms.

The main courses are integrated with laboratory works where students have the possibility to use real robots and to practice with state of the art tools and methodologies.

Artificial Intelligence may not only be the most exciting field in computer science, but of science in general. In fact, the best scientists of the future might even be AIs themselves. Hardware soon will have more raw computational power (CP) than human brains, since CP per cent is still growing by a factor of 100-1000 per decade. And there is no reason to believe that general problem solving software similar to that of humans will be lacking: there already exist mathematically optimal (though not yet practical) universal problem solvers developed at IDSIA. And existing highly practical (but not quite as universal) AI already learn from experience, outperforming humans in more and more fields. For example, biologically plausible deep/recurrent artificial neural networks are learning to solve pattern recognition tasks that seemed infeasible only 10 years ago. Even creativity has been formalized such that it can now be implemented on machines. The current developments in IS may soon lead to the end of history as we know it (more), and as an IS master student you can become part of this revolution. Artificial Intelligence systems have knowledge, beliefs, preferences and goals, and they have informational as well as motivational attitudes. They observe, learn, communicate, plan, anticipate and commit. They are able to reason about other systems and their own internal states, to simulate and

---

optimize their performance. AI systems react to dynamic situations adapting their capabilities through learning mechanisms, with a high degree of autonomy.

---

**Career opportunities**

Students graduating from this programme will develop a taste for working on complex problems. In their future careers they will be able to apply their knowledge in many interdisciplinary areas including robotics, business forecasting, intelligent search, video games, music and entertainment, chat bots, medical diagnostics, self-driving cars, to name a few.

---

**Study plan**

In this master programme a wide variety of techniques will be taught, including intelligent robotics, artificial deep neural networks, machine learning, meta-heuristics optimization techniques, data mining, data analytics, simulation and distributed algorithms. The main courses are integrated with laboratory works where students have the possibility to use real robots and to practice with state of the art tools and methodologies. After the first few lectures of the basic Machine Learning course, AI master students will already know how to train self-learning artificial neural networks to recognize the images and handwritings to the right better than any other known method.

**First semester**

Core Courses 18 ECTS	Machine Learning	Wand	6
	Deep Learning Lab	Vercesi	3
	Algorithms & Complexity	Papadopoulou	6
	Numerical Algorithms	Hormann	3
Electives 12 ECTS	Bioinformatics	Limongelli	6
	Edge Computing in the IoT	Ferrante	6
	Computational Biology and Drug Design	Limongelli	6
	High-Performance Computing	Eftekhari	6
	Introduction to Ordinary Differential Equations	Krause	6
	Knowledge Search & Extraction	Tonella	3
	Mathematics of Machine Learning (and AI)	Krause	6
	Mobile and Wearable Computing	Santini	6
	Programming Styles	Hauswirth	3
	User Experience Design	Landoni, Langheinrich	6
Writing Business Plans	Colombo	3	

**Second semester**

Core Courses 18 ECTS	Computer Vision & Pattern Recognition	Hormann	6
	Data Analytics	Crestani	6
	Robotics	Giusti	6
Electives 12 ECTS	Advanced Computer Architecture	Pozzi	6
	Advanced Networking	Carzaniga	6
	Business Intelligence and Applications	Martinenghi	6
	Business Process Modeling, Management and Mining	Pautasso	3
	Effective High-Performance Computing & Data Analytics	Schenk	6
	Entrepreneurship: Theory & Practice	Colombo	3
	Image & Video Processing	Didyk	6
	Geometric Algorithms	Papadopoulou	6
	Information Modeling & Analysis	Tonella	6
	Information & Physics	Wolf	3
	Introduction to Partial Differential Equations	Multerer	3
	Philosophy and Artificial Intelligence	Facchini, Smith	3
	Quantum Computing	Wolf	6
	Scientific Learning	Krause	6
Security Aspects of Machine Learning	Regazzoni	3	

**Third semester**

Core Courses 21 ECTS	Artificial Intelligence	Gambardella	6
	Distributed Algorithms	Pedone	6
	Advanced Topics in Machine Learning	Alippi	6
	Master Thesis	Faculty	9
Electives 9 ECTS	Choose from the electives of the 1st semester		

**Fourth Semester**

Core Courses 24 ECTS	Graph Deep Learning	Alippi	3
	Master Thesis	Faculty	21
Electives 6 ECTS	Choose from the electives of the 2nd semester		

<b>ETCS Total</b>			<b>120</b>
-------------------	--	--	------------

---

4 Semesters  
120 ECTS

---

## Computational Science

---

**Directors**

Olaf Schenk , Ernst Wit

---

**Goals and  
contents**

Computational Science is the quantitative study of complex systems. The Master of Science degree in Computational Science (MCS) at the Università della Svizzera italiana (USI) offers students the opportunity to acquire an in-depth understanding and set of skills in computational science. Computational science consists of a combination of

- Statistical Data Science
- Applied Mathematics
- High-performance Computing

It offers this innovative combination of methodological competences in data science, algorithmics and computing both to students who have a desire to work as a quantitative analyst in industry and as a computational scientist in academia.

The Master programme has a unique combination of courses from applied mathematics, statistical data science and computer science. There are additional optional courses from various applications domains, such as finance, biology and sociology, aiming at building deep application-oriented competences in computational science. Besides methodological skills and applications, the programme focuses on the use and development of scientific simulation and analysis software.

Students will acquire strong competences in abstract thinking within a methodology and application oriented education, which will provide the ability to deal with complex models in various applications areas.

A wide choice of elective courses enables, students can focus on one of the three methodological foundations, i.e., data science, applied mathematics and high-performance computing, or on a particular field of application.

**Career opportunities**

The Computational Science programme offers a streamlined blend of cutting-edge scientific research and practical applications, thus providing an excellent foundation for a corporate, industrial, or academic career. Our students receive a firm grounding in programming, data science, mathematical modeling and numerical simulation.

The Master in Computational Science opens the doors to industry in data science, computational engineering, financial services, chemical and pharmaceutical R&D. It is also a strong asset for a PhD in a computational science field, such as applied mathematics, statistics, AI and high-performance computing.

**Study plan**

Along with the mentor, each student will set up an individual study plan for selecting the appropriate elective courses. The mentor will advise and accompany the student throughout their study.



	Course	ETCS	ETCS
<b>First semester</b>			
Core Courses 24 ECTS	Efficient Computational Algorithms	Multerer	6
	High-Performance Computing	Eftekhari	6
	Introduction to Data Science	Wit	6
	Introduction to Programming	Binder	6
Electives 6 ECTS	Advanced Topics in Machine Learning	Alippi	6
	Analysis of Social Networks	Lomi, Amati	6
	Algorithms & Complexity	Papadopoulou	6
	Artificial Intelligence	Gambardella	6
	Bioinformatics	Limongelli	6
	Computational Biology & Drug Design	Limongelli	6
	Databases	Crestani	6
	Deep Learning Lab	Vercesi	3
	Distributed Algorithms	Pedone	6
	Distributed Systems	Eugster	6
	Introduction to Ordinary Differential Equations	Krause	3
	Machine Learning	Wand	6
	Numerical Algorithms	Hormann	6
	Scattered Data Approximation	Pivkin	3
	Software Tools for Computational Science	Raniolo	3
	<b>Second semester</b>		
Electives 30 ECTS	Advanced Computer Architecture	Pozzi	6
	Advanced Networking	Carzaniga	6
	Computational Fabrication	Didyk	6
	Computer Vision & Pattern Recognition	Hormann	6
	Data Analytics	Crestani	6
	Discretization Methods	Pivkin	6
	Effective High-Performance Computing & Data Analytics	Schenk	6
	Graph Deep Learning	Alippi	3
	Geometric Algorithms	Papadopoulou	6
	Graphical Models and Network Science	Wit	6
	Information & Physics	Wolf	3
	Introduction to Bayesian Computing	Mira	3
	Introduction to Partial Differential Equations	Multerer	6
	Particle Methods	Pivkin	6
	Quantum Computing	Wolf	6
	Robotics	Giusti	6
	Scientific Learning	Krause	6
	Stochastic Methods	Vecchi	6
	Text Analysis and Spatial Data for Economists	Parchet, D'Ambros	6
	<b>Third semester</b>		
Mandatory 6 ECTS	Preparation Master's Thesis	Faculty	6
Electives 24 ECTS	Choose from the electives of the 1st semester		24
<b>Fourth Semester</b>			
Mandatory 24 ECTS	Master Thesis	Faculty	24
Electives 6 ECTS	Choose from the electives of the 2nd semester		6
<b>ETCS Total</b>			<b>120</b>

## Master of Science in Informatics and Economics

4 Semesters  
120 ECTS

### Financial Technology & Computing

**Directors** Marc Langheinrich, Erik Nowak, Fernando Pedone, Peter Gruber

**Goals and contents**

The Master of Science in Financial Technology & Computing is offered jointly by the Faculty of Informatics and by the Faculty of Economics of the Università della Svizzera italiana. This unique cross-discipline programme combines USI's world-leading expertise in Finance and Informatics and offers exciting career prospects that range from fintech startups to banks and insurers to hedge funds.

This Master offers a highly challenging programme that delivers key skills in a novel interdisciplinary domain. It has been designed to provide students with the necessary tools and skills for understanding fundamental problems in finance while, at the same time, learn about the advanced information technology that is needed to drive the next generation finance services.

A two-track structure ensures that the level of Computer Science courses is commensurate with each student's background: students with a Bachelor degree in Computer Science and related disciplines take the "Advanced Informatics" track of the program, featuring advanced informatics classes such as Distributed Systems, High-Performance Computing, and Machine Learning; students with no formal Computer Science degree instead enroll in the "Core Informatics" track, which features a set of intensive foundational classes, such as "Fundamentals of Informatics", "Databases" and "Introduction to Programming".

In the first year, all students jointly take advanced courses in Finance and Financial Technology, such as "Blockchains and Digital Currencies" or "Data Analytics for Finance", before being able to individually diversify their programme along a large set of electives from both Finance and Informatics in year two, according to personal interests and abilities. Finally, the programme features a Master's thesis that can then be done either within the context of

---

a university research group, or in collaboration with industry embedded in our Fintech Laboratory.

Since English is the sole teaching language, graduates are well-prepared to work in international companies in Switzerland and beyond.

---

**Career opportunities**

The primary labor market for graduates of the programme is to be found in small Fintech startups, medium to large companies in the finance sector (e.g., banks, insurers, hedge funds), as well as the public sector, both in Switzerland and abroad. Many existing financial companies struggle to keep up with recent developments in finance technology and thus are in great need of informatics professionals who have a thorough understanding of finance. Potential job profiles range from system architect to system developer to service designer to financial consultant. With an MFT master from USI, students will be able to help banks, trading companies, and insurers master this new reality, or, alternatively, be well positioned to challenge existing players with their own startup.

---

**Study plan**

This full time programme stretches over two years. It allows students to personalize their study curricula according to their interests. The core skills are acquired in the first two semesters. The third semester is dedicated to more specialized courses and electives that can be chosen according to the students' preference.

	Course	Instructor	ECTS
<b>First semester</b>			
Core Courses 18 ECTS	Data Analytics for Finance I & II	Gruber	6
	Introduction to Fintech Investments**	Gruber Franzoni	6 6
	Advanced track 12 ECTS	Distributed Systems Machine Learning	Eugster Wand
Core track 12 ECTS	Fundamentals of Informatics Introduction to Programming (Python)	Sharygina Binder	6 6
<b>Second semester</b>			
Core Courses 24 ECTS	Blockchains & Digital Currencies	Morini	3
	Derivatives**	Mancini	6
	Information Security	Langheinrich	6
	Risk Management**	Plazzi	6
	Trading and Market Microstructure	Kaul	3
Advanced track 6 ECTS	Software Quality & Testing	Pezzè	6
Core track 6 ECTS	Data Management	Eugster	6
<b>Third semester</b>			
Core Courses 12 ECTS	Financial Modelling**	Franzoni	6
	Financial Econometrics**	Mancini	6
Advanced track 6 ECTS	Distributed Algorithms	Pedone	6
Core track 6 ECTS	Distributed System	Eugster	6
Electives 12 ECTS	Students choose from electives from the Informatics and Finance courses listed, and from other courses from the Master programmes offered by the Faculty of Informatics and the Faculty of Economics (upon approval of the Master's director).		
Informatics	Algorithms & Complexity	Papadopoulou	6
	Mobile and Wearable Computing	Santini	6
	Software Performance	Hauswirth	6
	User Experience Design	Landoni, Langheinrich	6
Finance	Advanced Topics in Finance	Della Corte, Füss	3
	Alternative Investments	Mueller	6
	Finance and Sustainability**	Frésard	3
	Financial Stability**	Mele	6
	Fixed Income and Credit Markets**	Mele	6
	Launching Fintech Ventures	Schueeli	3
	Innovation	Munshi	3
	Project Management	Gonçalves	3
	Qualitative Marketing Research and Data Analysis	Pellandini-Simányi	3

	Course	Instructor	ETCS
<b>Fourth Semester</b>			
Core Course 30 ECTS	Master Thesis *	Faculty	30
Electives	If Master thesis started in the 3rd semester (6 ECTS).		
Informatics	Robotics	Giusti	6
Finance	Critical Consumer Behaviour	Gibbert	6
	Human Resources Management	Solari	3
	Text Analysis and Spatial Data for Economists	Parchet, D'Ambros	6
<b>ETCS Total</b>			120

\* The Master Thesis can be started in the 3rd semester (6 ECTS).

\*\* To obtain the SFI accreditation, students have to achieve 45 ECTS among these courses.

## Master of Science in Informatics and Economics

4 Semesters  
120 ECTS

## Management & Informatics

<b>Directors</b>	Marc Langheinrich, Dirk Martignoni
<b>Goals and contents</b>	<p>The Master of Science in Management &amp; Informatics has been designed to provide graduates from a wide variety of backgrounds (informatics, economics, mathematics, business, engineering, etc.) with the necessary tools and skills for understanding complex information technology (IT) problems while, at the same time, knowing about the needs and requirements of a modern organization.</p> <p>This Master offers a balanced combination of courses that cover the necessary background in management, fundamental aspects of current and evolving IT, as well as specialized topics at the interface between management and informatics, such as enterprise resource planning. Since the programme is taught entirely in English, graduates are well prepared to work in international companies. Moreover, the interdisciplinary approach of this Master provides a general skill to work across traditional areas.</p>
<b>Career opportunities</b>	<p>Graduates from this Master will acquire a broad background in Informatics, allowing them to easily interact, on a technical level, with the IT department of an organization, both to evaluate technical proposals as well as to articulate possible solutions to the organization or the customer. On the other hand, graduates will also understand the tactical and strategic use of IT to enhance the efficiency of an organization, or how to explain user requirements in terms that can be understood by the IT department or the client. Most companies struggle with integrating IT in their organization, so people who can be the interface between the technical and organizational parts of a company are in great demand. Graduates of the programme will find work in medium to large companies, as well as the public sector, both in Switzerland and abroad.</p>

This full time programme stretches over two years, and allows students to personalize their study curricula according to their interests.

The basic knowledge is acquired in the first two semesters. Students who obtained a Bachelor's degree in informatics or a related field (mathematics, engineering, physics, etc.) enter the programme in the Informatics track and follow a set of courses that provide them with a fundamental insight into the management disciplines. In contrast, the Management track is tailored for students with a background in economics or management and teaches the basic aspects of informatics. In addition, all students attend mandatory courses that cover the interface between management and informatics.

The third and fourth semester are dedicated to specialized courses and electives that can be chosen according to the students' preference. Moreover, the students participate in a practical field project, which is done in groups for a real company, and conclude their studies by writing a substantial master's thesis.

Course	Instructor	ETCS
--------	------------	------

**First semester**

Core Courses 12 ETCS	Enterprise Resource Planning	Cappiello	6
	Enterprise Resource Planning Lab	Plebani	3
	Project Management	Gonçalves	3

Informatics track 18 ETCS	Corporate Strategy	Martignoni, Bettinazzi	6
	Financial Accounting	Seistrajkova	3
	Managerial Accounting	Seistrajkova	3
	Orthodox and Critical Perspectives in Marketing	Mendini, Visconti	6

Management track 18 ETCS	Databases	Crestani	6
	Fundamentals of Informatics	Sharygina	6
	Introduction to Programming	Binder	6

**Second semester**

Core Courses 9 ETCS	Business Intelligence and Application	Martinenghi	6
	Operations Management	Gonçalves	3

Informatics track 6 ETCS	Business Dynamics	Gonçalves	3
	Entrepreneurship: Theory and Practice	TBC	3

Management track 6 ETCS	Algorithms & Data Structures	Carzaniga	6
-------------------------------	------------------------------	-----------	---

Electives 15 ETCS	Advanced Corporate Strategy	Bettinazzi	3
	Business Dynamics*	Gonçalves	3
	Critical Consumer Behaviour	Gibbert	6
	Discrete Structures**	Wolf	6
	Human Resources Management	Solari	3
	Information Security	Langheinrich	6
	Robotics	Giusti	6
	Software Quality & Testing	Pezzè	6
	Text Analysis and Spatial Data for Economists	Parchet, D'Ambros	6

\* for Informatics track students

\*\* for Management track students

Course	Instructor	ETCS
--------	------------	------



**Third semester**

Core Courses 6 ETCS	Lean Six Sigma	Rossetti	6
Capstone Work 12 ETCS	Field Project	Langheinrich	12
Electives 12 ECTS	Analytical Thinking	Beck	3
	Business Analytics	Martignoni	3
	Digital Challenges in Marketing and Big Data	Silchenko	3
	Innovation	Munshi	3
	International Business	Luger	3
	Organizational Design & Change	Pallotti	3
	Service Design Marketing	Mandelli	3
	Distributed Systems	Eugster	6
	Machine Learning	Wand	6
Mobile and Wearable Computing	Santini	6	
User Experience Design	Landoni, Langheinrich	6	

**Fourth Semester**

Capstone Work 18 ETCS	Master Thesis	Faculty	18
Electives 12 ECTS	Choose from the electives of the 2nd semester		12
<b>ETCS Total</b>			<b>120</b>

4 Semesters  
120 ECTS

## Software & Data Engineering

### Directors

Cesare Pautasso, Gabriele Bavota

### Goals and contents

Software plays a pivotal role in almost all aspects of our life, including transportation, communication, economy, and health-care. We put trust in software to accomplish complex and vital tasks for us, such as managing our finances, sharing our family and friends' memories, diagnosing diseases, flying airplanes or driving cars.

The complexity of these tasks, while becoming transparent to us, does not go away: it is distilled into the software our civilization depends on. Indeed, we are already in the era of ultra-large-scale software systems, composed by millions of code components interacting among them.

In such a scenario, software cannot be understood without its data and data becomes valuable only thanks to the software analyzing it. In other words, software engineering aims at managing the complexity of software, keeping it under control. Data engineering focuses instead on how to collect, store, and process huge amounts of data, that can be analyzed to gather insights and support decision making activities.

### Career opportunities

Data is the new natural resource to be mined and exploited using software. Data analytics software provides actionable insights at the basis of continuous improvement and decision making processes. Such insights can be found by exploring large quantities of data, by asking the right questions and knowing how to reliably and efficiently find the appropriate answers. Students graduating in this Master are highly specialized software and data engineers, with high employability in industry, who are able to fully understand and manage the complexity of modern software systems and of the ocean of data surrounding them. Mastering how to effectively use software to deal with the data deluge is a key capability for any organization undergoing digital transformation efforts.

---

The demand for software and data engineers is currently very high and it is expected to grow even more in the near future across multiple industry domains (finance, energy, transportation, health, and media).

---

**Study plan**

The study programme consists of four modules:

1. **Software Engineering**  
The Software Engineering module embraces 30 ECTS and provides students with a deep knowledge of state-of-the-art techniques. Topics related to this module are software design, software architecture, software performance, software analysis, domain-specific languages, and programming styles.
2. **Data Engineering**  
The Data Engineering module includes three courses (18 ECTS) teaching students techniques and tools to design and model data (1st semester), to convert data into information (2nd semester), and to transform information into knowledge useful to support decision making activities (3rd semester). The topics studied in the Software and the Data Engineering modules are continuously integrated through the whole course of study. This is done by devoting 18 ECTS to deal with both Software and Data Engineering with project based learning during the Design 101, the Visual Analytics and the Software Analytics atelier.
3. **Electives**  
The Elective module includes 18 ECTS, that the student can freely select from a given list of courses offered at the USI Faculty of Informatics based on their personal preference.
4. **Master Thesis**  
Finally, the remaining 36 ECTS are dedicated to the MSc thesis. Students will use the 6 ECTS of the 3rd semester to visit the research groups of the Software Institute of the Faculty of Informatics and to prepare a thesis proposal. Then, they will work full time on the thesis in the 4th semester in the research group of their choice.

**First semester**

Mandatory 24 ECTS	Data Design & Modeling	Brambilla	6
	Design 101	Lanza	3
	Engineering of Domain Specific Languages	Mocci	3
	Programming Styles	Hauswirth	6
	Software Design & Modeling	Furia	6
Electives 6 ECTS	Advanced Java Programming	Binder, Rosà	6
	Distributed Systems	Pedone	6
	High-Performance Computing	Eftekhari	6
	Mobile and Wearable Computing	Santini	6

**Second semester**

Mandatory 18 ECTS	Information Modeling & Analysis	Tonella	6
	Software Analysis	Furia	6
	Visual Analytics	D'Ambros	6
Electives 12 ECTS	Advanced Networking	Carzaniga	6
	Information Security	Langheinrich	6
	Software Quality & Testing	Pezzè	6

**Third semester**

Mandatory 24 ECTS	Knowledge Search & Extraction	Tonella	6
	Software Analytics	Bavota	6
	Software & Data Engineering Seminar	Faculty SI	6
	Software Performance	Hauswirth	6
Electives 6 ECTS	Advanced Java Programming	Binder, Rosà	6
	Distributed Systems	Pedone	6
	High-Performance Computing	Eftekhari	6
	Mobile and Wearable Computing	Santini	6

**Fourth Semester**

Mandatory 30 ECTS	Master Thesis	Faculty	30
----------------------	---------------	---------	----

<b>ETCS Total</b>			<b>120</b>
-------------------	--	--	------------

---

PhD

Phd



The PhD programme of the Faculty of Informatics promotes the development of professionals interested in academic or industrial research.

The PhD program is structured according to:

- Duties: they define the activities that each PhD student performs as a service to the Faculty.
- Competencies: they define the general skill set required by all graduates of the program.
- Milestones: they are visible achievements for both the student and the Faculty to assess the progress towards graduation.

A successful PhD student will gain a broad knowledge and understanding of the general field of informatics, as well as an in-depth specialisation in an area of interest. Working with one or more members of the Faculty, who serve as the student's advisors, the student will learn the methods and practical skills to conduct research, and will contribute original, useful, and scientifically valid ideas in their chosen area of interest.

PhD students are also encouraged to explore other areas and to interact and collaborate with other students and professors within the Faculty as well as in the broader research community.

Teaching is an integral and formative component of the PhD programme.

PhD students are thus expected to serve as teaching assistants and undergraduate student mentors.

At present the Faculty awards the following qualifications:

- PhD in Informatics
- PhD in Computational Science.

---

The PhD programme is governed by regulations adopted by the Faculty:  
[www.inf.usi.ch/en/regulations-and-forms](http://www.inf.usi.ch/en/regulations-and-forms)

For more information about the programme and admission:  
[www.inf.usi.ch/en/phd-doctoral-studies](http://www.inf.usi.ch/en/phd-doctoral-studies)

### **Study plan**

The Faculty of Informatics offers PhD courses to students pursuing a PhD at the Faculty. The course Introduction to Doctoral Studies is mandatory for first year PhD students. Master courses may be cross- listed as PhD courses.





Publisher	USI Università della Svizzera italiana
Production	Faculty of Informatics
Grid design	CCRZ
Layout	Servizio grafica
Date	September 2023
Orders	USI Università della Svizzera italiana Via Buffi 13 6900 Lugano, Switzerland + 41 58 666 4000 + 41 58 666 4647 info@usi.ch www.usi.ch



Università  
della  
Svizzera  
italiana



Faculty  
of  
Informatics

Plan of studies  
3-5-8

**2023/24**