DOUBLE DEGREE

in

COMPUTATIONAL SCIENCE AND ENGINEERING

at the

POLITECNICO DI MILANO, ITALIA

EXCHANGE REPORT

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1. Student identity and EPFL program

Ondine Chanon, Swiss and French, studying Computational Science and Engineering, first year of Master's Degree.

2. Host university and department

Politecnico di Milano, Italy, department of Mathematics, speciality in Computational Science, first year of Master's Degree (laurea magistrale).

3. Practical questions

- Before leaving:
  Being French, I have the European nationality, and thus I did not need to do any visa nor study permit to come to study in Italy. Moreover, the European health care is sufficient.
  You do not really need to speak Italian before leaving (I began to learn Italian in July before leaving and it came very fast once arrived in the country), but for all the administrative issues, it might however be easier to have some basis. If you make an effort, everyone will be nicer with you once in Italy: just say « Buongiorno ! » and they will smile at you. Enjoy being there to learn this wonderful language !

- Beginning of the academic year :
  First day of lectures around mid-October. Possible intensive Italian courses in Como (1h away from Milan by train) during the two first weeks of September. Welcome week (to attend !) late September/early October.

- Accommodation:
  Standard price for a single room in a shared apartment : 500€/month + utilities (gas, electricity, internet). For a double room in a shared apartment : 300-
400€/month + utilities. It is advised to find privately a room to rent, because housing agencies ask for extra taxes and for a bigger deposit. There also exist residences provided by the university, but to get a spot, you need to apply very early. I have never been there but I have only heard very good things about it.

- **Food, cafeterias and restaurants**:
  There are some cafeterias on campus. As well, there are lots of food trucks in the streets which sell different products (sandwiches, panini, pizza, etc.), or even little student-price restaurants in Città Studi (the neighbourhood where is the campus of Leonardo, which is the central campus of the Politecnico).

![Il Duomo, cathedral of Milan, historical city center](image)

- **Once there, administrative formalities**:
  You need to get the « codice fiscale », which is an identification code that allows you to sign contracts (housing, phone, public transportation, etc.). It is strongly needed! To get it, go to one of the Azienda delle Entrate in Milan, with the needed papers (to be found on the internet, cf. the exchange/international student guide sent by the Politecnico by email before the beginning of the year). Make the line, fill in a form, and you get it straight away.

- **Transportation in Milan and in Italy**:
  - City public transport : ATM (metro, buses, trams). 22€/month ; 200€/year for students under 26 years old. Single ticket : 1,50€ for everyone.
  - Cheap ways to travel in Italy/Europe : Megabus (VERY cheap), Eurolines, car sharing (blablacar), trains if you book in advance (trenitalia, trenord), easyjet.
• Weather:
  - Autumn with a lot of rain, but quite warm.
  - Winter very nice (never below 0°C), snow only if you are lucky.
  - Spring very warm with big evening storms.
  - Summer very hot and humid (between 25 and 40°C), take very light clothes!!
• Holidays:
  - Christmas holidays, around ten days long, from Christmas to a few days after New Year's Eve.
  - Inter-semester holidays only if you are lucky with your exam dates; end of the exams in February/early March.
  - Easter, one week long.
  - Summer holidays: August 1st – October 15th (approximatively).
• End of terms, exam dates:
  - End of the first term: around the end of January. Exams during the whole month of February.
  - End of the second term: around the end of June. Exams during the whole month of July.

4. Courses and projects: academical aspects

— FIRST TERM —

*** Fluid labs – 095962 ***
Pr. Malavasi and Pr. Balli (Attended in italian)
10 ECTS; 6h of lectures a week, 5h of labs (every week out of 3, more or less)

Description:
**Exam**: 3 small benchmark projects + Group lab project + Oral exam + Group project presentation.

**Personal remarks**: Since before this one, my last course in physics was two years before, it was very hard to get into it, and the course is asking a lot (time – really a lot –, energy, understanding). But this is a very interesting course and it is absolutely fundamental for this study plan. Professors are available for questions. It was in italian but it could be in English if you ask. It would have been better for me since it is already a lot demanding from the point of view of the physical content, but I realized it too late.

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**Unicredit Tower, new downtown**

*** **Algorithms and Parallel Computing – 095959** ***

Pr. Cremonesi (Attended in English)
10 ECTS ; 8h of lectures a week

**Description**:
Data-intensive applications such as data mining, recommender systems, scientific computation, financial modelling and multimedia processing have implications on the design of algorithms and provide a new challenge for the modern generation of computing platforms. Parallel processing is the only cost-effective method for the fast solution of these big-data problems. This course provides the students with all the skills necessary to write efficient algorithms, able to solve large-scale problems on parallel computers.

**Exam**: Final project.

**Personal remarks**: Very interesting course, very good personal contact with the professor, interesting final project. The lectures are not too enthusiastic though ; I would prefer to implement more and listen less, but this is a personal opinion. There is also quite a lot of superposition with the course of Informatique I and II of EPFL, mathematics, 1st year.
Description:

Exam: Not attended.

Personal remarks: I took this course instead of « Real and functional analysis » (095958) since I had already done the latter the year before. But being a course of last year, in italian, needing « Fluid labs » as a prerequisite, I got lost after one week and I directly decided to give up, since I did not have a sufficient background to go on. Very helpful professors though. Instead, I took « Model Identification and Data Analysis » (cf. behind).
Pr. Bittanti (Attended in English)
10 ETCS; 5h of lectures, 3h of exercises a week

**Description:**
5. Applications and discussion of real world problems.

**Exam:** Written exam.

**Personal remarks:** Interesting course, very funny professor, quite easy but it would have been better if I had some background in Automation: I had to catch up some parts. Exercise sessions very important but a bit boring: you do not do the exercises by yourself, they are done on the blackboard by the assistant. It has been very useful to discover other fields of applications of mathematics.
— SECOND TERM —

*** Advanced Partial Differential Equations – 095963 ***

Pr. Salsa (Attended in English)
8 ECTS ; 6h of lectures a week

Description :

Exam : Written midterm + Final written exam + Optional oral exam.

Personal remarks : Very important and interesting course. This is the most theoretical course of the year, very demanding. The professor encourages us to work regularly and to participate, this is a great point not to be lost at the end of the term. He is always available for questions, doubts, etc.

Teatro alla scala, one of the most famous opera house of the world

*** Numerical Analysis for Partial Differential Equations – 095964 ***

Pr. Perotto (Attended in Italian)
10 ECTS ; 8h a week, in general 4h of lectures, 2h of computer lab, 2h of seminar

Description :
The aim of the course is two-fold: 1) enhance the analysis of finite element approximation of partial differential equations by addressing two- and three-
dimensional problems and extending the topics addressed in the course "Numerical Analysis of Partial Differential Equations I". Study new problems more focused on Engineering applications. 2) Support the theoretical lessons with exercise and lab sessions to validate the theoretical results and face practical applications.

**Exam**: Written midterm + Final written exam + Final project.

**Personal remarks**: Very important course, very well given, and interesting. The professor is very open to questions. It is a great idea to have seminars to discover domains of application and to open our minds. Too bad that it is almost impossible to begin the project before the end of the term though.

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Universal Exposition, EXPO2015, italian pavilion with the tree of life

*** Advanced Programming for Scientific Programming – 095965 ***

Pr. Formaggia (Attended in English)
10 ECTS ; 5h of lectures, 3h of computer lab, 2h of tutoring (not mandatory) a week

**Description**: The course focuses on C++ programming applied to scientific computing. The syllabus comprises object oriented and generic programming techniques; metaprogramming and expression templates; the Standard Library, design pattern techniques. In this exposition we will always refer to typical scientific computing applications. The course gives also elements of parallel computing (MPI and OpenMP), debugging and profiling techniques, static and dynamic libraries and illustrate some important open source libraries for scientific computing.

**Exam**: Final project.

**Personal remarks**: Course full of important notions, but hard to follow in class. Almost too many information are given. This is while doing the project that you really learn the whole theory studied during the term. Too bad that it is also almost impossible to begin the project before the end of the term though.
5. Validation by the EPFL of the credits obtained abroad

Italy being in the European Union, the ECTS system works perfectly fine and without surprise. You always have five possible tries for each exam: two during the exam session that directly follows the term in which you have attended the course (i.e. in February for courses taken during the fall term, and in July for courses taken during the spring term), one during the next exam session, and two in September.

It is important to know that, in general, Italians are very flexible and fair. Do not hesitate to ask with a smile if you have a problem! Only negative point: I have to finish two projects during the summer/the following year since it was not possible to begin them during the term, needing the content of the whole courses.

6. General remarks and advices

To sum up, if I had just one advice to give: GO ABROAD!! This is a wonderful experience that you will not make ten times in your life, you will meet lots of amazing persons from all around the world (if you go to Milan, especially Latin-american ones!), and you will come back full of unforgettable memories!

Milan is a wonderful city, always active and full of events, incredible if you are fan of fashion and design, but also music and art, or any other thing: you will always find something that corresponds to you. Awesome city to go out, to eat well (go and discover what an Italian aperitivo is!), to chill in a park on the sun; you will never finish to discover it. And if you get the occasion to travel a bit around (and you should!), Italy is a wonderful country, full of history, full of surprises and full of smiles. I hope that one day, I will stay there again for some more time...!

More academically speaking, the level at the Politecnico di Milano is very high, and consequently, this year has been very interesting. It will broaden your mind, and the professors there give lots of opportunities to make good contacts for the future: then, up to you to take the opportunity... ENJOY!