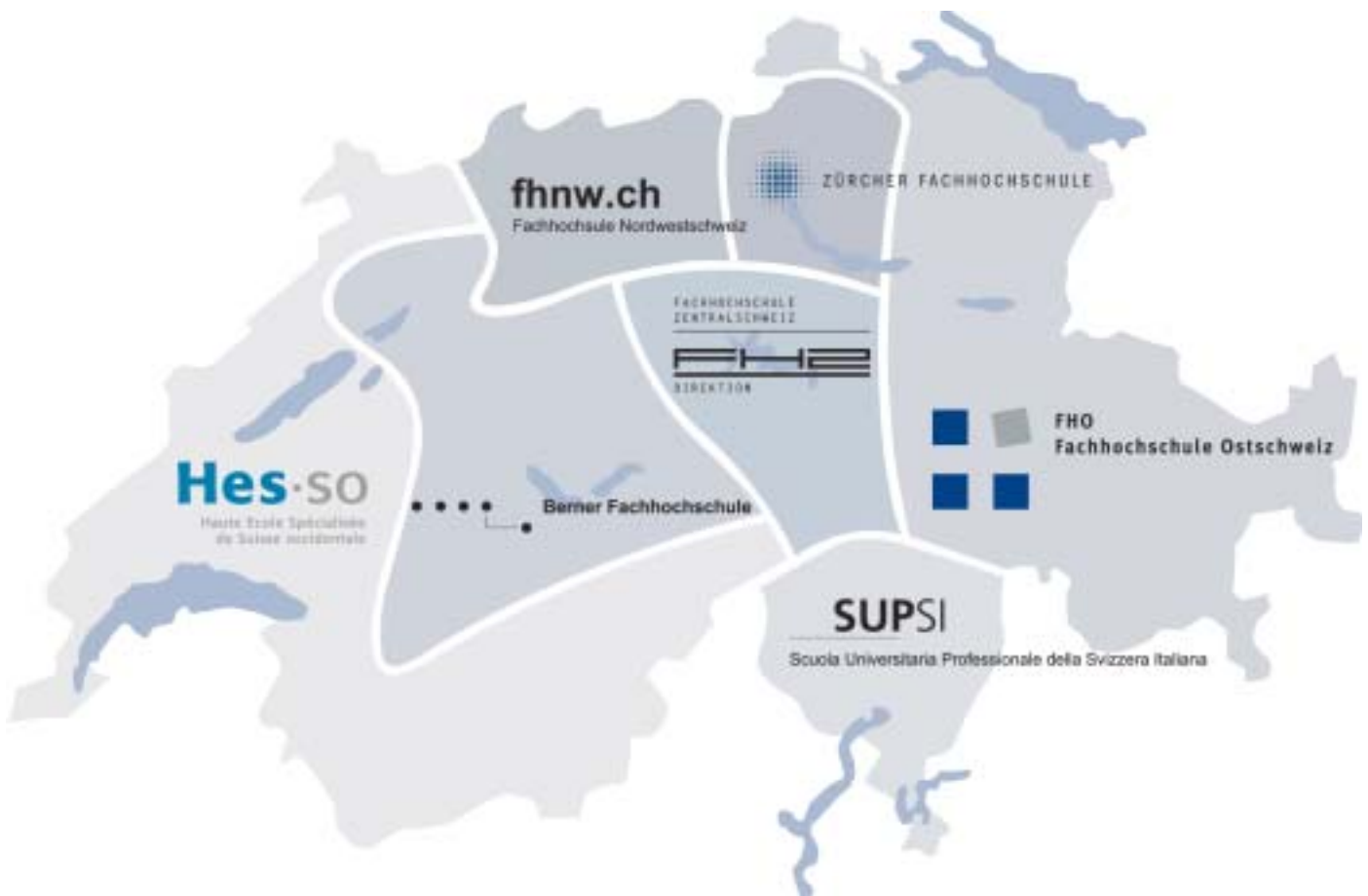




# Swiss Master of Advanced Studies Nano- and Micro Technology

Federally recognized postgraduate education in  
Nano- and Micro Technology

Jointly offered by the Swiss Universities of Applied Sciences



# 1. The Master of Advanced Studies

The Master of Advanced Studies (MAS) is the official title recognized by the confederation for postgraduate studies at the master level in the natural and engineering sciences.

The MAS has replaced all the unofficial master titles, which have been offered by the various educational institutions in the past. It is distinct from the MSc. through its smaller number of ECTS (70 instead of 90), the mandatory fee and the restricted access. It is targeted at students and professionals, who want to acquire all necessary professional skills through a shorter, but much more intensive training. This intensity is generated through small restricted classes and focus on laboratory research.

# 2. Nanotechnology

Engineering @ nanoscale means designing, manufacturing and controlling systems and components at the level of 10<sup>-9</sup> which is a 1/1000th of a micrometer or a microsecond.

The operation of many products and industrial systems depends already today on controlling part of their components at the nanoscale: notable examples are watches, car engines, the cells of the human body, integrated circuits, information storage and communication devices, etc.

Thus, product design @ nanoscale and process engineering @ nanoscale are important steps towards realizing the manufacture, operation and reliability of those systems. It can be shown in many cases that the costs of ownership of a product can be reduced substantially by applying product design @ nanoscale and process engineering @ nanoscale.

Therefore, nanoscale devices and processes are the tools necessary to monitor and modify these systems in a focussed and economic way. The fact that so many everyday products and systems rely on control @ nanoscale ensures that nanotechnology will occupy an important part of our future engineering activities. It can be assumed, that engineering neglecting nanoscale aspects will be limited to a fraction of total engineering activities in the future.

Nanoscale engineers are now and will be increasingly in the future, seizing the opportunity to create a host of new products and services, which we can only begin to imagine.

# 3. Objectives of the Master of Advanced Studies in Nano- and Micro Technology program

**The objective of the master program in Nano and Micro Technology is the education of nanoscale engineers from talented engineers and students who have graduated in micro technology, mechatronics, data analysis & process design, mechanical, electrical and chemical engineering.**

The master course in NMT is a result of the joint effort of all the professors and lecturers of the Swiss Universities of Applied Science specialized in the various fields of micro- and nanotechnology. To achieve this, they had created in 2002 the nanoplatform of the UAS with the objectives of


- Organizing the teaching at the postgraduate level in Nano- and Micro technology to offer the students with a bachelor degree a frame to acquire competence in the use of NMT-tools
- Integrating the R&D departments of the private sector into the postgraduate education at the UAS.

The master course in NMT is a novel and innovative form of training and should prepare you for your future job as

- Nanoscale and micro technology engineers
  - Innovating product design
  - Innovating manufacturing processes
- Engineers transforming research results into innovative products

You will also benefit from the fact that the nanoplatform is

- In partnership with industry, serving in particular the R & D needs of SMEs.
- A vehicle for the integration of the Swiss community of applied R & D in the field of NMT into the European Research Area (ERA). This is be used to assure not only euro compatibility, but also to organize exchange



programs with the objective to participate in the training of nanoscale euro-engineers, a goal pursued currently by different European educational institutions.

The proposed master course in Nano- and Micro Technology will provide you with:

- An in-depth understanding of nanoscale phenomena
- Skills in modifying and monitoring components @ nanoscale
- Skills in solving packaging problems and in using system integration technology
- The multidisciplinary know-how in informatics, physics, biology, material science that is now essential for success in engineering @ nanoscale

The masters graduate in NMT will be able to understand and use the tools and equipment of current nanotechnology. Particular emphasis is put on hands-on experience. The participation in the course of other Swiss institutions with internationally recognized experience in nanotechnology (such as EMPA, PSI and the university of Neuchatel) will give you the opportunity to acquaint yourself with a broad spectrum of equipment and R & D possibilities in the field of nanotechnology. This is made possible, by the distribution of the classes all over Switzerland.

Introducing you to the national industrial and research capabilities and enhancing your intercultural capability are additional benefits of a nation wide education. Training Swiss-engineers is a logical first step for training Euro-engineers.

The master course is built from 28 weekly courses, which take place at the following sites: Buchs, Le Locle, Muttenz, Manno, Winterthur, Burgdorf, Aarau, Yverdon and Geneva. They have been chosen for the availability of the necessary equipment.

**About 1/4 of the participants in these courses are engineers from industry who want to acquire particular skills or competencies. This cooperation with peers who are active in their profession, gives you an additional important training opportunity, and provides you with a sizable network of professional relations at the end of the course.**

## 4. Educational Program

### 4.1 Forms of participation:

The whole master's program, is completely modular. You can earn your master degree over any period of time by following weekly courses and enlisting for a master thesis at the end. The expiration date for any ECTSs granted in this program is 6 years.

The masters program corresponds to the equivalent of one full year of studies and will earn 60 ECTS points. It requires successful validation of 20 weekly courses corresponding to 40 ECTS points and successful defence of a diploma thesis earning you an additional 20 ECTS points. You can currently choose from a total of 30 courses offered. These courses are spread over the whole year. You can start anytime with any of the courses. Their content is independent. The curriculum comprises furthermore a master's thesis work of at least 4 months. It is open for

- Full time students
- Part time students, which can spread their master's thesis over the whole duration of their studies:
  - 2 years at 1/2 time corresponding to 10 weekly courses/ year on average
  - 3 years at 1/3 time, corresponding to 6-7 weekly courses/year on average.

Part time students can do their thesis work on the premises of their employers.

### 4.2 Size and Content:

The courses are grouped around the following themes:

- Micro technology
- Nanotools for surface analysis and modification
- Surface functionalisation @ nanoscale
- Design of components and systems for micro and nanotechnology
- Nanomaterials

About 1/2 of the lessons consist of practical training in the laboratory.

### 4.3 Practical Organisation:

Your stay at the various locations will be organized by a local committee, which will provide you with the following services.

- Joint low cost lodging for all the participants choosing this option
- Assistance in reservation of individual hotels
- Joint on site lunches and dinners for all the participants choosing this option

Note, that the costs for lodging and meals are not included in the fees.

The fees do include:

- Full set of booklets of all the courses of the program, including those, you have chosen not to attend.
- Refreshments during the break
- Office space at the university, where you can do your homework and discuss with your colleagues. The space will have the entire infrastructure necessary including internet access through the university server
- Library service
- Literature retrieving services
- All other services offered to its students by the hosting university

## 5. Validation: examinations and approval of the master's thesis

The validation consists of 3 elements:

- Each weekly course ends with an examination. It will be marked from A to E. Only courses, where the examination has been passed successfully are taken into account for the admission to the final exam and the master thesis. This examination earns an individual certificate worth 2 ECTS points. The certificate remains valid, even, if you do not complete the full program.
- The diploma thesis will be evaluated by 2 experts and also be marked from A to E
- A defence of the diploma work in front of a jury of at least 5 experts comprising the 2 experts that have evaluated the thesis. The defence can be public or confidential – if the content of the thesis is confidential.

An accepted thesis and a successful defence earn you 20 ECTS.

Only students, who have successfully accomplished all 4 elements of validation can claim the title of Master of Advanced Studies in Nano- and Micro technology.

An accepted thesis and a successful defence earn you 20 ECTS.

## 6. Conclusion and title

Students, who have successfully accomplished all 3 elements of validation, can claim completion of the federally recognized postgraduate course in Nano- and Micro technology.

Students, who will have successfully concluded the master course, are authorized to carry the title

**Master of Advanced Studies in Nano- and Micro technology,  
The Universities of Applied Science of Western Switzerland;  
MAS, UASWS, NMT**

Master of Advanced studies is the official federal title for postgraduate masters. It is protected by a new federal law.

## 7. Conditions for admission

Participation is limited to engineers and scientists

7.1 Graduated in one of the following disciplines: micro technology, mechatronics, data & process design, mechanical engineering, electrical engineering, systems engineering, chemistry, life sciences, physics, materials science or associated disciplines

Required level: Bachelor, diploma EPF, UAS or equivalent (bac + 3+),

7.2 Accepted by the research team cooperating in the master's thesis

7.3 Accepting the contractual conditions of the master's thesis work with respect to confidentiality and ownership of industrial property.

For more informations, please contact one of the responsible persons at the end of this document.



## 8. Registration

You can register at any UAS participating in the program. The list of contact persons is given at the back cover. The contact person will evaluate your eligibility and discuss your research interest with you, in order to direct you to the team most appropriate for your master's thesis.

The number of students is strictly limited to 20. Acceptance is based on professional and academic qualification. The criteria are available on request.

## 9. Fees

The following list of fees applies:

<b>Master course:</b>	<b>10 000 Swiss Francs</b>
<b>Postgraduate short course:</b>	<b>2 000 Swiss Francs. Discounts are available for students booking several short courses.</b>
<b>Local housing (optional):</b>	<b>about 160-400 CHF per week of course</b>

## 10. Conditions of payment

In signing the registration form, the student agrees with the terms and contracts the obligation to pay the integrality of the fees according to the following schedule:

Registration fee	<b>CHF 2000.-</b> due march 1st 2006
Monthly instalments of	<b>CHF 400.-/short course</b> according to the number of courses followed due the 1st of each month.

Students with backward dues can be excluded from the courses.

Each diploma thesis will be financed by a contribution of Swiss Francs 20 000.- from the industrial partner.

## All conditions subject to change

## Detailed Program

Course	Lecturers	Place	Dates 2006
<b>1. Micro- and Nanotechnology</b>			
1.1 Microtechnical processes I	Rudolf Buser Herbert Keppner Serguei Mikhailov	Buchs	February 13 -18
1.2 Microtechnical processes II	Rudolf Buser Herbert Keppner Werner Raupach	Buchs	February 20 – 25
1.3. Sensors and actuators in the NMT field	Rudolf Buser Nelly Bogdanova	Buchs	March 6 – 11
1.4. System integration	Rudolf Buser Raimund Bauknecht Nico Onda	Buchs	March 13 – 18
<b>2. Nanotools for surface analysis and modifications</b>			
2.1. Micro & Nanoanalysis I: Imaging techniques	Serguei Mikhailov Nelly Bogdanova Gianni Fiorucci Silvia Schintke Marc Jobin Bruce Patterson Massoud Dadras	Le Locle	March 27 – April 1
2.2. Micro & Nanoanalysis II Chemical composition and mapping	Serguei Mikhailov Frans Munnik Massoud Dadras	Le Locle	April 3 – 8
2.3. Nanotools for surface structuring I X-ray, Electron and Ion beam systems	Serguei Mikhailov Nelly Bogdanova Frans Munnik Jens Gobrecht	Le Locle	April 24 – 29
2.4. Nanotools for surface structuring II Research and Industrial trends	Serguei Mikhailov Philippe Niedermann Urs Sennhauser Marc Jobin Herbert Keppner Martin Guggisberg	Le Locle	May 8 – 13
2.5. Real Space Imaging at the Nanoscale I Scanning Tunneling Microscopy and Scanning Nearfield Optical Microscopy	Silvia Schintke Peter Walther	Yverdon	October 2 – October 7
2.6. Real Space Imaging at the Nanoscale II Atomic Force Microscopy	Marc Jobin	Geneva	May 29 – June 3
<b>3. Surface functionalisation @ nanoscale</b>			
3.1 Surface cleaning technology	Nelly Bogdanova Eva Moser	Muttenz	May 15 – 19
3.2. Surface modification from solutions	Martina Hirayama Thomas Spielmann	Winterthur	September 18 – 23
3.3. Surface functionalisation through topography	Werner Raupach Nelly Bogdanova Eva Moser	Windisch	November 13 – 18
3.4. Laser modification of surfaces and Laser micromachining	Beat Neuenschwander	Burgdorf	November 20 – 25
3.5 PVD/CVD process engineering @ nanoscale	Erich Bergmann Rick Welty Raymond Constantin	Geneva	June 19 – 24



## Detailed Program

Course	Lecturers	Place	Dates 2006
3.6 Sustainable and Biocompatible Surfaces through advanced PE-CVD Processes	Eva Moser Jukka Lausmaa Detlef Theirich	Geneva	June 26 – July 1
<b>4. Components, Systems and Design for Nano and Micro Technology</b>			
4.1. Computer Aided Engineering	Hansueli Schwarzenbach Beat Ruhstaller Martin Hocker	Winterthur	September 25 – 30
4.2. Photonics	Beat Neuenschwander Beat Ruhstaller Benno Bucher Peter Walther	Burgdorf	Nov. 27 – Dec. 2
4.3. Manufacturing and Packaging	Hans W. Van de Venn Hansueli Schwarzenbach Beat Ruhstaller	Winterthur	December 4 – 9
4.4. Measurement	Silvio Balemi Joseph Moerschell	Manno	October 23 – 28
4.5. Nanoassembly, Instrumentation	Marc Jobin Joseph Moerschell Thomas Graf	Geneva	July 3 – 8
<b>5. Nanomaterials</b>			
5.1. Introduction and selected Applications of Nanomaterials	Erich Kramer Serguei Mikhailov Helena van Swygenhoven Jens Gobrecht Erich Bergmann	Brugg	December 11 – 15
5.2. Nanopowders	Thomas Graule Stephan Siegmann Christian Bonjour	Dübendorf	October 9 – 14
5.3. Nanoparticles	Thomas Graule Erich Kramer Heinrich Kuhn Gilles Triscone	Dübendorf	October 16 – 21
5.4. Nanotubes: Synthesis and selected Applications	Silvia Schintke Mirko Croci Pierangelo Gröning	Yverdon	September 4 – 9
5.5. Nanocomposites: Characterisation and Application	Christian Bonjour Herbert Keppner Erich Bergmann Pierre-Albert Steinmann Oksana Banakh	Le Locle / Geneva	May 22 – 26
<b>6. Biological and Medical applications of NMT</b>			
6.1. Bioactive surfaces	Uwe Pieleis	Muttenz	January 23-28
6.2. Cell culture technology and its application in nanotechnology and biomedicine	Ursula Graf-Hauser	Winterthur	September 11 – 16
6.3 Biotechnological applications of Nanotechnology	Daniel Gygax	Muttenz	August 21 – 26
6.4 Applications of Nanotechnology in medical technology	open	Biel	May 12 – 16

## Contact persons

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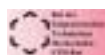
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