Project for the Internationalisation of the Iraqi Institutional-Scientific Structures and the Collaboration with Italian Scientific and Academic Centres

SUMMER SCHOOL: 8th September - 8th October 2008, Milano, Italy

Activity proposal  Electron and ion microscopy and micromanipulation: common principles and advanced methods in applied sciences

Organizers  M. Daniela Candia (UNIMI); Marziale Milani (UNIMIB)

Topics  Physics, biology, engineering, materials science, nanotechnology

Purpose  Formation (theory/ technics/ experiments)
Research activation
Technology transfer from university to industry

Instrumentations  FIB – ESEM: Focused Ion Beam – Environmental Scanning Electron Microscope
SEM: Scanning Electron Microscope
TEM: Transmission Electron Microscope
EDS: Energy Dispersive Spectroscopy
The Course is open to graduate/PhD and postdoc students with a good background in basic and applied Sciences, particularly interested to improve their theoretical and technical preparation in advanced microscopy and related application in physics, biology and material sciences. The language of the course is English. The course is aimed to promote the development of intellectual skills required at a specialized level of professional preparation. The scientific themes will cover a wide range of applications of advanced microscopy in physics, biology, engineering and material sciences.

The course is subdivided into two parts: a general part addressed to all the students and a specific training on some specialized topics selected by the students themselves. During the course students will attend frontal lectures and practical lab, and will do experimental bench work and analyses of results at all level, including advanced mathematical methods (statistics, computer modelling) and bibliographic analysis. Active participation of the students in all the activities of the course will be requested. Communication skills of students will be developed, including formal interactions with instructors, collaborative work with other participants, oral presentation of problems and results, written report describing experiments and analysis of results.
**GENERAL AGENDA of ACTIVITIES** (see pag. 6 for details)

<table>
<thead>
<tr>
<th>Topics</th>
<th>Timing</th>
<th>Lecturers:</th>
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</thead>
<tbody>
<tr>
<td>(Welcome) THEORY</td>
<td>Common part of the course 1 week</td>
<td>M.D.Candia, M.Milani, G.Melone, F.Fascio, V.Capasso, G.Naldi, G.Pacchioni, F.Tatti, L.Ferraro</td>
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<tr>
<td>FIB/ SEM (Milan- UNIMIB)</td>
<td>Common part of the course 2 days</td>
<td>M.Milani, F.Tatti, M.Acciarri, C. Savoia</td>
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<tr>
<td>SEM/TEM (Milan- UNIMI)</td>
<td>Common part of the course 2 days</td>
<td>M.D.Candia, G.Melone, U.Fascio, N. Santo, F.Bonasoro</td>
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<tr>
<td>SELECTED TOPICS Physics, biology, engineering, materials science, nanotechnology</td>
<td>Small team or individual specific Training 2 weeks</td>
<td>Physics: C. Savoia Materials Science: M.Acciarri M.Milani Biology: M.D.Candia, G.Melone, U.Fascio, N. Santo F.Bonasoro Engineering: F.Tatti</td>
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<tr>
<td>FINAL REPORTS, EVALUATION, FAREWELL Contribution of students: specific thematic journal club presentation of research results</td>
<td>Common part of the course 2-3 days</td>
<td>All Lectures &amp; Trainers</td>
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Scientific Committee

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INVOLVED INSTITUTIONS

Landau Network-Centro Volta (LNCV) is a non-profit and non-governmental organization based in Como, Italy and operating as a global network of international experts supporting global security, disarmament and cooperation. Its programs cover international security and policy issues, worldwide disarmament of weapons of mass destruction, arms control, scientific and technologic cooperation for global peace support, water and energy security.

UNIMIB – Università degli Studi di Milano Bicocca, Dipartimento di Scienza dei Materiali
Building U5, via Cozzi 53, 20125 Milano, Italy
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UNIMI - Università degli Studi di Milano, Dipartimento di Biologia
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FEI Company is a leading supplier of Tools for Nanotech™ enabling research, development and manufacture of products at the Nanoscale. Our range of industry-leading focused ion and electron beam hardware and software products are delivered to four primary Nanotechnology markets: NanoElectronics, NanoResearch, NanoIndustry and NanoBiology.

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CIMA (Centro di ricerca Interuniversitario in Monitoraggio Ambientale) is a public research and technology cooperation body established by the two Universities of Genoa and Basilicata. CIMA’s mission is to advance the science and engineering in environmental related fields through research and development, and to provide technology transfer and training services.

ADAMSS (Centro Interdipartimentale di Advanced Applied Mathematical and Statistical Sciences) is an Interdisciplinary Centre dedicated to Mathematical Modelling, Statistical Analysis, and Computational Simulation for Scientific and Technological Innovation. A successor of the ADAMSS Centre, formally established in 1999, it has evolved from a much longer term experience in applying modern mathematical, statistical and computational methods to problems arising from Industry, Finance, Economy, Medicine, etc. and in all Applied Sciences. The activity has increasingly involved researchers from both University (from about all departments of the Milan University) and Industry at large. ADAMSS has been established at the University of Milan with the financial support of a number of associated industries.

Consorzio Milano Ricerche (CMR) is a non-profit organisation established in 1986 to promote and manage research and innovation through cooperative projects linking universities, research centres, industrial companies and small and medium-sized enterprises (SMEs). The activities of Milano Ricerche are designed to turn the specific needs and the core competencies of industrial companies and SMEs into research projects which are eligible to be funded at regional, national or EC level and which will result into increased competitiveness for all partners.

**DISSEMINATION ACTIVITY**

- Publications of Lecture Notes & photobook
- Publication of Official Report
- Advertisement on newspapers, universities and institutions web-sites, and scientific
- Newsletters
DETAILED PROGRAM

Week 1: Common Part of the Course
(8th September - 12th September)

WELCOME AND THEORY

8th September
Milano-Bicocca: Building U5, Aula Facoltà, 2nd floor

10.30 – 12.30 OPENING SESSION: Welcome
R. Redaelli, University Authorities, Invited Guests

PRESENTATION OF GENERAL PROGRAM
M.D. Candia, M. Milani

12.30 – 14.30 WELCOME BUFFET

14.30 – 18.30 INTRODUCTORY SESSION: Presentation of Students with their CV. Visit to local scientific structures

9th September
Milano-Bicocca: Building U5, Aula Facoltà, 2nd floor

9.00 – 12.30 Lecture: TEM: Theory and applications
M.D. Candia

14.30 – 18.30 Lecture: FIB/SEM: a tool for fundamental and applied research
M. Milani
Lecture: FIB as an opening mind tool
C. Savoia

10th September
Milano-Bicocca: Building U5, Aula Facoltà, 2nd floor

9.00 – 12.30 Lecture: SEM: Theory and applications
G. Melone

14.30 – 18.00 Lecture: CONFOCAL/TEM: Theory and applications
U. Fascio

11th September
Milano-Bicocca: Building U5, Aula Facoltà, 2nd floor

9.00 – 10.30 Lecture: From materials science to nanotechnology
G. Pacchioni

10.30 – 12.30 Lecture: Imaging generation and reliability in scanning electron/ion microscopy
L. Ferraro

14.30 – 18.00 Lecture: Statistical analysis of microstructural models
V. Capasso

12th September
Milano-Bicocca: Building U5, Aula Facoltà, 2nd floor

9.00 – 12.30 Lecture: Mathematical methods in Image Analysis
G. Naldi

14.30 – 18.00 General Discussion. Test: checking understanding level
**Week 2: Common Part of the Course**  
(15th September - 19th September)

**FIB/SEM (Milan-UNIMIB) + SEM/TEM (Milan-UNIMI)**

15th – 16th September  
*Milano-Bicocca: Department of Materials Science*  
9.00 – 18.00 Demonstrations:  
*Physics, Materials Science, Engineering.* Instruments, general equipment, their employment  
M. Milani  
F. Tatti  
C. Savoia  
M. Acciarri

17th - 18th September  
*Milano-Città Studi: Department of Biology*  
9.00 – 19.00 Demonstrations: *Biology.* Instruments, general equipment, their employment  
M.D. Candia  
G. Melone  
U. Fascio  
N. Santo  
F. Bonasoro  
A. Barbaglio

19th September  
*Milano-Bicocca: Department of Materials Science*  
9.00 – 18.00 General Discussion  
Formation of Small Research Teams (SRT)  
Meeting with Trainers and Planning of training activities

**Weeks 3 - 4: Small Research Teams (SRT) and Individual Specific Training**  
(22th September – 3rd October)

**SELECTED TOPICS**  
(Biology, Physics, Engineering, Material Science)

22th – 25th September  
*Milano-Città Studi: Department of Biology*  
*Milano-Bicocca: Department of Materials Science*  
9.00 – 18.00 Training of SRT in the laboratories  
Individual Specific Training

26th September  
*Milano-Città Studi: Department of Biology*  
*Milano-Bicocca: Department of Materials Science*  
9.00 – 18.00 Thematic Journal Club + First Informal Report

29th September – 3rd October  
*Milano-Città Studi: Department of Biology*  
*Milano-Bicocca: Department of Materials Science*  
9.00 – 19.00 Specific Thematic Journal Club + Second Informal Report
FINAL REPORTS, EVALUATION, FAREWELL

Week 5: Common Part of the Course - Contribution of Students:
Presentation of Research Results and Final Report
(2 days: 6th-7th October)

SELECTED TOPICS
(Biology, Physics, Engineering, Material Science)

6th October
Milano-Città Studi: Department of Biology

9.00 – 18.00 Individual Presentation of Results
Final Official Report

7th October
Milano-Città Studi: Department of Biology

9.00 – 12.30 Evaluation
12.30 – 14.30 FAREWELL BUFFET

Speakers:

M. Acciarri UNIMIB
A. Barbaglio UNIMI
F. Bonasoro UNIMI
M. D. Candia UNIMI
V. Capasso UNIMI
U. Fascio CIMA – UNIMI
L. Ferraro UNIMIB
G. Melone UNIMI
M. Milani UNIMIB
G. Naldi UNIMI
G. Pacchioni UNIMIB
R. Redaelli Landau Network – Centro Volta
N. Santo UNIMI
C. Savoia ST Microelectronics
F. Tatti FEI Company