



SCUOLA INTERNAZIONALE SUPERIORE DI STUDI AVANZATI

Il Direttore

PROT 2301- III/S

N. 131/2018

- VISTO l'art. 1, comma 5 dello Statuto della Scuola pubblicato sulla G.U. n.36 del 13.02.2012;
- CONSIDERATO che la Scuola intende attivare anche per l'anno accademico 2018/2019 il corso di perfezionamento "Master in High Performance Computing";
- VISTA la delibera del Consiglio del Laboratorio Interdisciplinare per le Scienze Naturali ed Umanistiche del 13.02.2018;
- VISTA la delibera del Senato Accademico del 20.02.2018;
- VISTA la delibera del Consiglio di Amministrazione del 27.02.2018;

DECRETA

- Art. 1 È indetto, per l'anno accademico 2018/19, il concorso per titoli, esami e colloquio per l'ammissione al corso di perfezionamento "Master in High Performance Computing" gestito dal Laboratorio Interdisciplinare per le Scienze Naturali ed Umanistiche della Scuola Internazionale Superiore di Studi Avanzati di Trieste;
- Art. 2 I requisiti di ammissione, i tempi e le modalità di espletamento delle procedure concorsuali sono specificati nell'allegato bando di concorso che costituisce parte integrante del presente decreto.

Trieste,

- 2 MAR. 2018

IL DIRETTORE

(Prof. Stefano RUFFO)

cp/



High Level Education in High Performance Computing: MHPC presentation. Application Call 2018 - 2019

SISSA and ICTP promote a 12 months education program in High Performance computing. The program spans the 2018-2019 period, starting from September 17, 2018.

Short description

The Master in High Performance Computing (MHPC) hosted and organized by SISSA (International School for Advanced Studies) and ICTP (Abdus Salam International center for theoretical physics) is an innovative degree program devoted to training students in the booming field of HPC. SISSA and ICTP are well known first rank institutions in applied and theoretical mathematics and physics. The mutual effort pursued by the two institutions results in a stimulating and motivating environment.

High Performance Computing (HPC) plays a key role in science, engineering, and manufacturing processes. Here we present the International Master in High- Performance Computing (MHPC). We remark its key role in intercepting the exponentially growing technologies in HPC and inject them into industry and academia.

MHPC is an innovative educational program. It trains scientists and professionals to modern computational technologies. The qualified student gains a deeper understanding of the technical pros and cons of each computational strategy. MHPC trains students in taking the right decision with the right tools to tackle specific computational problems. Students that complete this Master will have a solid background in scientific computing approaches, algorithms, and modeling. We remark that this is an unique opportunity to train young motivated students that combine scientific and computing skills.

The program combines lectures with hands-on tutorials. Tutorial sessions are strongly application-oriented. A final thesis defence completes the program. During the thesis development, students collaborate with both industrial and academic personnel, addressing frontier applications of HPC. In this strategic phase students are supported with adequate fellowships.

Courses

The courses are organized not to overlap, so that students can be fully concentrated on each single course at a time. Most of courses have a full day program which includes active lectures during the morning and practice hands-on tutorials during the afternoon, and they are held in contiguous days to enroll as lectures also internationally renowned scientist coming from abroad. Tutorial sessions are strongly application-oriented and will be used to assess the learning process. A final thesis defence completes the program. During the thesis development, students collaborate with both industrial and academic personnel, addressing frontier applications of HPC. In this strategic phase students are supported with adequate fellowships.

PART I, HPC Concepts and Programming: ~5 months

Advanced and parallel programming, software design and management, numerical analysis, data management, computer hardware and administration.

- **1.1 Scientific programming environment**
- **1.2 Introduction to Computer Architectures for HPC**
- **1.3 Introduction to Parallel Programming**
- **1.4 Advanced Programming**
- **1.5 Introduction to Numerical Analysis**
- **1.6 High Performance Computing Technology**
- **1.7 Scientific data management**
- **1.8 Advanced Linear Algebra Libraries and Accelerators**
- **1.9 Best Practices in Scientific Computing**

PART II, HPC Algorithms for Science and Technology: ~1 months

The second part of the master is devoted to implement HPC strategies in non standard scientific and industrial applications. This part is composed by one mandatory course and other optional courses (≥ 1 month, i.e. ≥ 16 CFU where 4 CFU mean approximately one week of course). Optional courses will be held only if a sufficient number of students will be attending. The second part is spread from February to June included. The courses of the second part of the previous edition are:

- **2.1 Data Structures & Sorting and Searching (mandatory)**
- **2.2 Electronic structure: from blackboard to source code (2 CFU)**
- **2.3 Advanced Computer Architectures & Optimizations (4 CFU)**
- **2.4 The Finite Element Method Using deal.II (4 CFU)**
- **2.5 Reduced Basis Methods (4 CFU)**
- **2.6 Fast Fourier Transforms in Parallel and Multiple Dimensions (2 CFU)**
- **2.7 Cluster Analysis (2 CFU)**
- **2.8 Monte Carlo methods (4 CFU)**
- **2.9 Supervised Machine Learning (2 CFU)**
- **2.10 Approximation and interpolation of simple and complex functions (2 CFU)**
- **2.11 Spatial locality algorithms (2 CFU)**
- **2.12 Big Data Processing with MapReduce (4 CFU)**
- **2.13 Lattice Boltzmann (2 CFU)**
- **2.14 Molecular dynamics (2 CFU)**

PART III, HPC Thesis development: 6 months

During the last period of the master, students will develop a technically and scientifically challenging project in collaboration with an on-going research team and/or an industrial partner. In their projects, students apply the skills developed in the previous sections of the program. Project proposals must be submitted to and accepted by a committee and must be overseen by a qualified adviser. The project should not last more than nine months and should then be reported in a written thesis. The thesis development may overlap with the second part.

Prerequisites

MHPC is accessible by Italian students graduated with "laurea magistrale (D.M. 270/2004)" and "laurea Vecchio Ordinamento (L. 341/1990)". International applicants with a Bachelor, Master or Doctoral degree are welcome.

Application Procedure

The application procedure is available online at www.mhpc.it. The application deadline for those who are requesting full support to ICTP is set **to April 23, 2018 at 11:59 am** in order to allow proper amount of time for Visa procedures of the selected candidates. The deadline for all other applications is set **to July 9, 2018 at 11:59 am**.

Evaluation Procedure

The online applications will be evaluated mostly on the applicant curriculum. A short phone interview might be required. Maximum 15 positions are available. The full course fee is € 7.000,00.-. Supporting institutions may be available in supporting motivated students by paying the course fee.

MASTER IN HIGH PERFORMANCE COMPUTING

Via Bonomea, 265 - 34136 Trieste - Tel. +39 040 3787 479; e-mail: info@mhpc.it

Italian privacy disclaimer:

Ai fini del D.Lgs. 196/2003, si informa che la Scuola Internazionale Superiore di Studi Avanzati si impegna a rispettare il carattere riservato delle informazioni fornite dai candidati; tutti i dati notificati saranno trattati solo per le finalità connesse e strumentali all'ammissione, nel rispetto delle disposizioni vigenti.

Trieste, March 2018

MHPC Coordinator
Luca Heltai