Магистърска програма Високо Производителни Изчисления (ВПИ)

European Master for High Performance Computing (HPC)

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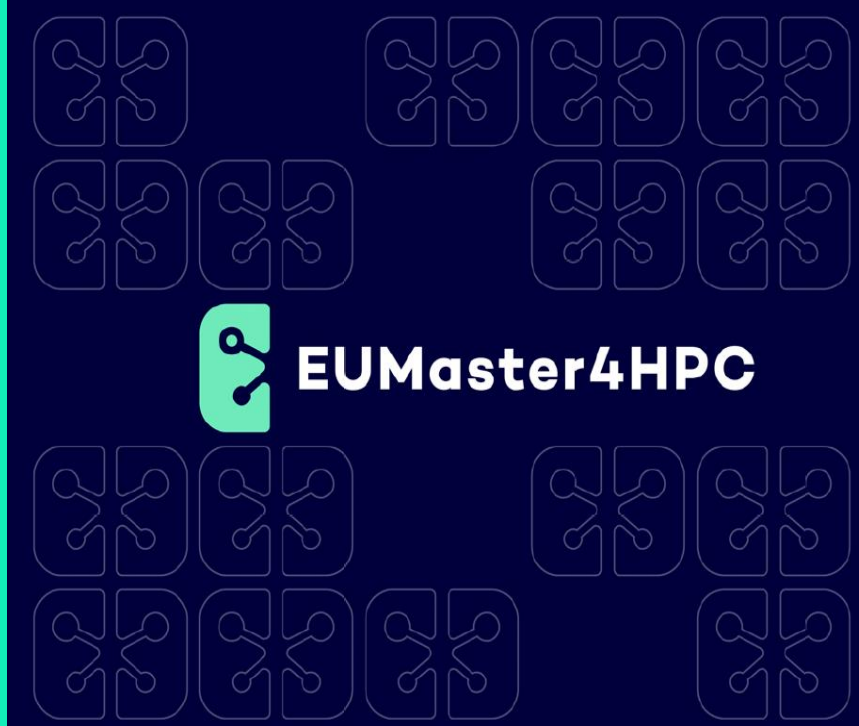

Отлични възможности за кариерно развитие

EUMaster4HPC включва водещи Европейски университети, научни центрове за ВПИ и индустриални партньори, обединени около мисията за създаване на общоевропейска магистърска учебна програма в областта на ВПИ чрез изграждане на мрежа от съмишленици с обща цел укрепване на общността за ВПИ в Европа.

Чрез обединението на основните играчи в областта на обучението за ВПИ в Европа, се цели подготовката на нова генерация от високо квалифицирани и отлично подготвени експерти, които да играят водеща роля в процесите на дигиталната трансформация на Европа.

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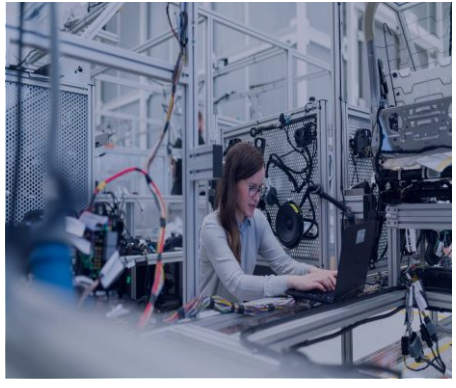
HPC IN ACTION

1 Manufacturing

Running simulations, such as for autonomous driving, to support the design, production and testing of new products. This enables safer cars, lighter parts, more efficient processes and innovation.



2 Genomics

DNA sequencing, drug interaction analysis and performing protein assays to support provenance studies.

3 Healthcare

Drug research, vaccine creation and development of innovative treatments for rare and common diseases.

4 Technology for finance

Performing complex risk analysis, high-frequency trading, financial modelling and fraud detection.

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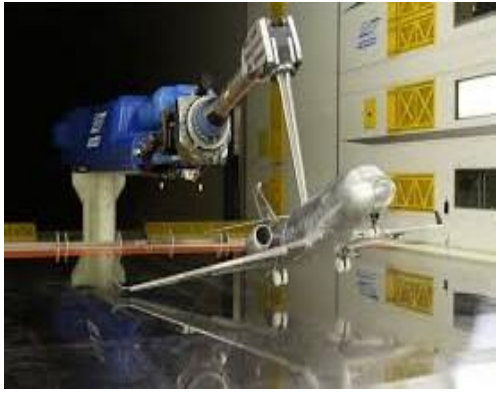
HPC IN ACTION

5 Media and entertainment industry

Animation creation, rendering special effects for films, transcoding huge media files and creating immersive entertainment shows.



6 Aerospace industry

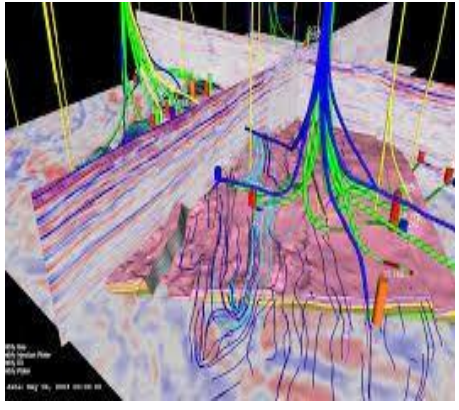
Creation of complex simulations, such as airflow over aircraft wings.

7 Healthcare

Analyse vast amounts of customer data to provide targeted product recommendations and improve the customer experience.

8 Oil and gas industry

Performing spatial analysis and reservoir model testing to predict oil and gas locations, and performing simulations such as fluid flow and seismic processing.



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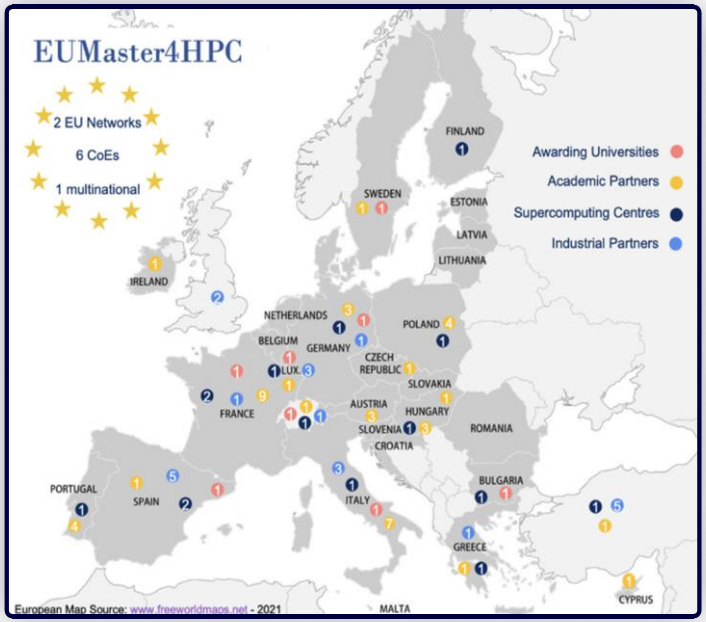
8 AWARDING UNIVERSITIES

1. Sorbonne Université, France
2. Universitat Politècnica de Catalunya, Spain
3. Politecnico di Milano, Italy
4. Università della Svizzera Italiana, Switzerland
5. Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
6. University of Luxembourg, Luxembourg
7. Sofia University "St. Kliment Ohridski", Bulgaria
8. KTH Royal Institute of Technology, Sweden

21 PARTICIPATING COUNTRIES



29 NON-AWARDING UNIVERSITIES | 16 CONTRIBUTING PARTIES (INDUSTRY AND RESEARCH) | 36 ADDITIONAL SUPPORTING PARTNERS

Образователни цели

Основна цел: да запознае студентите с водещи HPC технологии и да създаде умения за използване на пълния потенциал на най-мощните суперкомпютри

- **Програмата се провежда 4 семестър и изисква постигане на 120 ECTS кредита**
- **Програмата се провежда на английски език**
- **Включва един семестър мобилност до избран водещ Европейски университет**
- **Стаж в някой от 8-те най-мощни центрове за ВПИ в Европа през 4-и сем.**
- **Първите два семестъра се изучават в СУ – ФМИ**
- **Учебното съдържание е стандартизирано чрез международния проект**
- **Възможност за стипендии и за финансова помощ при мобилност в друг университет**

This project has received funding from the European High-Performance Computing Joint Undertaking under grant agreement No 101051997

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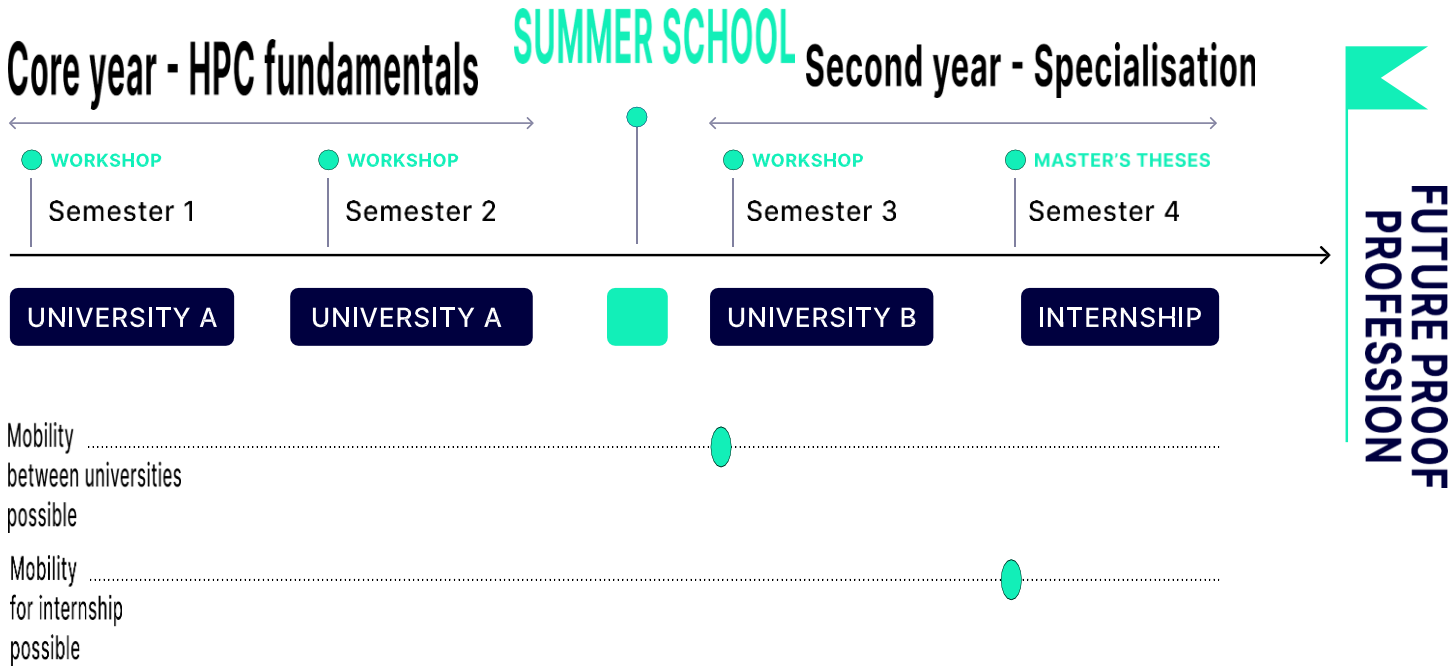
ACADEMIC JOURNEY



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WHAT'S IN STORE FOR STUDENTS

2 European diplomas

Mobility

Internship

HPC networking and strong link with the Industry

FUTURE-PROOF PROFESSION

Scholarship

Summer school

Workshops

Academic excellence

EUMaster4HPC

STUDY PROGRAM

1ST YEAR

Fundamentals

- Mathematics and Statistics
- Software Engineering
- Parallel Programming
- Computer Architecture

2ND YEAR

Specialization

- Application Domain Expert
- Numerical and Data Specialist for Science Domains
- Performance Analyst and Advisor
- System Development and Support
- System Architect

Internship

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Насоченост

Програмата е насочена към 2 основни групи обучаеми:

- **Учени от природните науки, желаещи да получат знания и умения за решаване на сложни задачи от тяхната научна област с прилагане на ВПИ**
- **Специалисти по информатика и компютърни науки за проектиране и създаване на алгоритми и софтуер за решаване на сложни задачи, както и за поддържане на инфраструктури за ВПИ**

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Прием

Студентите се приемат по правилата на СУ-ФМИ:

- **Заявяват желание за обучение в сайта на СУ**
- **Кандидатите за държавна поръчка държат тест**
- **Кандидатите за платено обучение се приемат без изпит**
- **Отделно може да се кандидатства за международна стипендия и финансова помощ за мобилност**

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Курсове 1-и семестър в СУ - ФМИ

HPC Архитектури

Основни математически методи и алгоритми

Статистика

Основи на програмирането

Основи на изкуствения интелект и науката за данните

Операционни системи и компютърни мрежи

Сигурност в компютърни системи и мрежи

Паралелно програмиране

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Курсове 2-и семестър в СУ - ФМИ

Компютърни архитектури за HPC за напреднали
Виртуализация и Cloud Computing
Практикум по програмиране
Паралелна и разпределена обработка
Математични методи и алгоритми за напреднали
Анализ на ефективността и модели
Създаване на технологични предприятия
Отговорни научни изследвания (RRI), отворени данни, запазване на чувствителни данни (GPDR)

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Курсове 3-и семестър в СУ – ФМИ (1)

Приложно машинно обучение

Квантови алгоритми и програмиране

Представяне на знания и семантични Уеб технологии

Квантови изчисления

Въведение в квантовите технологии

Квантови симулации и метрология

This project has received funding from the European High-Performance Computing Joint Undertaking under grant agreement No 101051997

Курсове 3-и семестър в СУ – ФМИ (2)

HPC за прогноза на времето и климата

Изчислителна биология

Изчислителна Физика

Числени методи в химията

Научно писане

This project has received funding from the European High-Performance Computing Joint Undertaking under grant agreement No 101051997

EUMaster4HPC

INTERNSHIP IN INDUSTRY AND SUPERCOMPUTING CENTERS

Semester 4

Students will gain a quickly practical experience through internships at partner companies and access to Europe's advanced HPC infrastructure

EUMASTER4HPC WAS FORMED BASED ON THE DEMAND AND NEEDS OF THE INDUSTRY

INDUSTRY IS A MAJOR PARTNER OF EUMASTER4HPC

EUMaster4HPC

WORKSHOPS

Semester 1, 2, 3

- Mandatory three workshops in the middle of semesters 1, 2 and 3
- A students' challenge before the start of the workshop (e.g. a hackathon modelled on the hackathons offered by technology vendors to code-development labs)
- These projects are proposed and organized by the supercomputer centers

THE AIMS OF THESE ACTIVITIES ARE:

- increasing group cohesion
- immersion of students in the subject of the specialty (3rd semester)
- establishing contacts with companies and supercomputer centers
- enable companies to exchange experiences with students and make connections for internships and/or future recruitment

EUMaster4HPC

LEARNING OUTCOME

NEXT GENERATION OF HIGHLY SKILLED HPC EXPERT

- Demonstrate a broad understanding of artificial intelligence, high performance data analytics, scientific computing, computational numerical analysis, and multidisciplinary knowledge of machine learning and data analytics, computational science - biotechnology, material science, physics, chemistry and mechanics (solid and fluid)

- Demonstrate a broad understanding of parallel programming (including GPU and FPGA), distributed systems, middleware technologies, software engineering, compilers, compiler optimisation, parallel programming design, applications & parallel performance analysis and quantum computing

EUMaster4HPC

LEARNING OUTCOME

NEXT GENERATION OF HIGHLY SKILLED HPC EXPERT

- Demonstrate a broad understanding of application life-cycle, component integration, software stacks (for CPU, GPU, FPGA CRGA), operating systems, kernel development, parallel file systems, high-speed networking, synchronisation, container technologies, virtualisation technologies, integration of HPC and cloud, server administration and infrastructure setup management & security

- Demonstrate a broad understanding of SoC design, NoC design, microarchitecture, memory systems, circuit design (VLSI design flow), power dissipation, low-power design techniques, thermal power models, verification and test, reliability, multiprocessor design, accelerators (GPUs, FPGAs, CGRAs), application-specific architectures, hardware-software codesign, cooling mechanisms, and deployment technologies

EUMaster4HPC

by using the online application form

APPLY https://eumaster4hpc.uni.lu/application/

WHO CAN APPLY

1. **Bachelor's degree (preferably CE/INF)**
   Or equivalent qualification in computer science, relevant scientific or technical field, or mathematics.
2. **English proficiency**
   at least CEFR B2 / TOEFL 85/ IELTS 5 or higher, no more than 3 years old; or a certificate confirming that student have completed an undergraduate/master's degree programme in English).
3. **Commitment to move to another awarding university for the second year of Master's degree**
   The EUMaster4HPC programme is designed to promote student mobility for part of the specialisation during the second year of study.
4. **Knowledge of programming**
   Or more than 2 university courses in computer science from data structures, algorithms, programming or theoretical or technical computer science.
5. **Comprehensive training in technical mathematics: algebra, linear algebra and probability and statistics, functional analysis, numerics, optimisation, simulation / scientific computing**

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HOW TO APPLY

THE APPLICATION PERIOD IS CONTINUOUS

- Check the documents needed to complete the application on the EUMaster4HPC website
- Fill in the application form and attach the documents

https://eumaster4hpc.uni.lu/

- After submitting the application, student will be contacted by the team via email. If deemed necessary by the jury, a face-to-face interview (online) will follow.
- Student will be informed about the selection result via e-mail latest 2 weeks after the end of the current application period.

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SCHOLARSHIP AND TUITION FEES

for eligible students*

- 5.000 € of "Mobility Scholarship" to support expenses inherent to the programme (travel and accommodation)
- the tuition fees are waived

for non-EU/Non-EuroHPC member country

- other scholarships, grants and financial aid
- possibility to receive local scholarships
- tuition fees per awarding university

In order to achieve an inclusive and equal programme, the EUMaster4HPC will waive University fees for the eligible students*.

*Students coming from Member States and Associated Countries that have chosen to become members of the Joint Undertaking and who comply with the programme requisites: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey

Acknowledgements

EuroHPC
Joint Undertaking

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