

Fusion Education in the EU

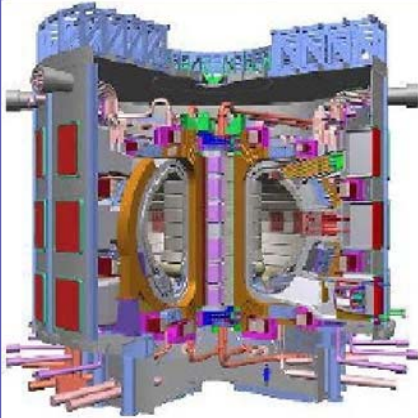
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Training and Education in the EU

- Mobility Scheme (starting usually from Post-Doc level)
- National schemes and fellowships by the associated laboratories
- **Erasmus Mundus Master Scheme**
- European PhD in Fusion Science and Engineering
- Euratom: European Training Scheme for ITER: selected laboratories offer posts on key topics for ITER R&D
- **EU CSA „Fusion Education Network- FUSENET**

European Master in Nuclear Fusion Science and Engineering Physics



Education and Culture

Erasmus Mundus

European Master In Nuclear Fusion
Science **and** Engineering Physics

What?

The aim of the European Master in Nuclear Fusion Science and Engineering Physics (FUSION-EP) programme is to provide a high-level multinational research-oriented education in fusion-related engineering physics, in close relation to the research activities of the partners, and with a well-integrated language and cultural experience.

Why?

The Joint European Masters Programme offers a genuine European opportunity for Master level studies in a field which is of crucial importance to contribute to the solution of the ever more urgent and vital problem of world energy supply.

Focussed on Magnetic Confinement Fusion

Ideal preparation for ITER

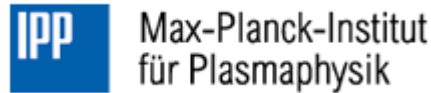
Who?

Ghent University, Gent
Kungliga Tekniska Högskolan, Stockholm
Universidad Complutense de Madrid
Universidad Carlos III, Madrid
Universidad Politécnica de Madrid
Université Henri Poincaré, Nancy
Universität Stuttgart

Linked institutions

- *Trilateral Euregio Cluster (Belgium, Germany, Netherlands)*
- *National Magnetic Confinement Fusion Laboratory (CIEMAT, Spain)*
- *Spanish National Research Council (CSIC, Spain)*
- *Autonomous University of Madrid (Spain)*
- *University of Cordoba (Spain)*
- *CEA Cadarache (France)*
- *Max-Planck-Institut für Plasmaphysik (Germany)*





Course programme and mobility

First semester (30 ECTS)

Plasma physics
Atomic and molecular physics
Classical electrodynamics
Mechanics of continuous media
Language and culture.

Second semester (30 ECTS)

Instrumentation
Lab project
Elective a
Elective b

Summer event

Third semester (30 ECTS)

Elective 1
Elective 2
Elective 3
Elective 4
Language and culture.

Fourth semester (30 ECTS)

Master thesis

All courses (**English**) count 6 ECTS credits except for the master dissertation which counts for 30 ECTS (1ECTS=10 hours)

In view of the expertise of the partners, the programme offers **three programme tracks** to the student:

- *T1: Plasma physics (fusion-oriented)*
- *T2: Computational methods in physics*
- *T3: Instrumentation and radiation*

Admission Criteria

The minimum graduate admission requirements are:

- A **bachelor degree** or recognized equivalent from an accredited institution (minimum 3 years study) in physics or engineering .
- Sufficient undergraduate training to do graduate work in the chosen field.
- A **satisfactory scholastic average.**
- Sufficient knowledge of English**

Applicants with another degree but with experience or knowledge in one of these fields can be admitted on decision by the FUSION-EP Steering Committee on the basis of CV and other evidence.

Erasmus Mundus Scholarships (20 per year) for non-EU students

This is a scholarship for 4 semesters and consist of twenty monthly instalments of 1600 euro and a yearly fee of 5000 euro to cover expenses, like subscription fees, insurances and administration.

Visiting Scientist Scholarship

Scholarships are granted to highly qualified third-country to carry out teaching and research assignments and scholarly work in FUSION-EP institutions.

Each academic year there are 4 grants for third-country scholars. The duration of the visit is maximum 3 months.

The fee for scholars is 4000 € per month (for a maximum of 3 months) plus installment fee of 1000 €.

Fees and living expenses

The subscription fee for students who obtained an Erasmus Mundus scholarship is 6000 euro per year (subject to yearly revision by the FUSION-EP Steering Committee). This includes the selection cost, FUSION-EP joint Master fee and the institutional subscription fees.

FUSION-EP students are expected to finance their accommodation, insurances, living cost and travel costs themselves. The respective institutes have services for foreign students that can provide assistance in arranging accommodation, insurances and other living arrangements.



Websites of organising institutes and Steering Committee members

- Ghent:** <http://physics.ugent.be/appliedphysics/> (Ghent University)
Prof. Guido Van Oost (Guido.VanOost@UGent.be); manager: Frank Janssens
- Stockholm:** http://www.kth.se/eng/education/programmes/master_english/index.html (KTH)
Prof. Michael Tendler (michael.tendler@alfvenlab.kth.se)
- Madrid:** *Local coordinator* :Prof. Carlos Hidalgo (carlos.hidalgo@ciemat.es)
<http://www.nuclear.es/> (Universidad Complutense de Madrid)
Prof. José-María Gómez-Gómez (gomezk@fis.ucm.es)
<http://www.upm.es/> (Universidad Politécnica de Madrid)
Prof. José Manuel Perlado (mperlado@din.upm.es)
<http://bacterio.uc3m.es/investigacion/> (Universidad Carlos III de Madrid)
Prof. José Ramón Martín-Solís (solis@fis.uc3m.es)
- Nancy:** <http://www.lpmi.uhp-nancy.fr/lpmi/master.php>(Université Henry Poincaré de Nancy)
Prof. Gérard Bonhomme (Gerard.Bonhomme@lpmi.uhp-nancy.fr)
- Stuttgart:**<http://www.ipf.uni-stuttgart.de> (Universität Stuttgart)
Prof. Ulrich Stroth (stroth@ipf.uni-stuttgart.de)

External members of Steering Committee

- Dr. Jean Jacquinot** (Jean.JACQUINOT@cea.fr)
CEA:<http://www.cea.fr>
- Ir. Christian Dierick** (christian.dierick@agoria.be)
(ITER Belgium) <http://www.iterbelgium.be>

Coordinating Institute

Prof. Dr. G. Van Oost
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<http://www.em-master-fusion.org>



N Europe



Stockholm



Gent



Stuttgart



Nancy



Madrid

<http://www.em-master-fusion.org>

Erasmus Mundus *Action 3*

Between an Erasmus Mundus Master Course and at least one higher education institution from a third country

Duration: 3 years (renewable)

Outgoing mobility allowances are available for European Erasmus Mundus students and scholars offering them the opportunity to spend a short period of time at third-country partner universities.

International Network for Nuclear Fusion Education

Partner (ITER) countries: USA, Russia, China

- UCLA (USA)
- University of Wisconsin-Madison (USA)
- St. Petersburg State Polytechnic University (Russia)
- Moscow Engineering Physics Institute (Russia)
- University of Science and Technology of China (Hefei), Tsinghua University Beijing and Southwestern Institute of Physics, Chengdu.

Action 3: Partnerships

- ✓ Grants for EU-students and EU-scholars involved in Erasmus Mundus Masters Courses for mobility period (3 months) at third-country partner institution
- ✓ In principle 5 EU-students per year and institution within a consortium and 2 EU-scholars per year and partner country
- ✓ Recognition of study periods acquired at the third-country partner institution
- ✓ Teachers' exchanges, development and dissemination of new methodologies in higher education, development of co-operation schemes with third-country institutions, etc.

Joint French/Erasmus Mundus
Proposal for a

**European Doctoral College
in Nuclear Fusion Science &
Engineering**

(Federation of Home Doctoral Schools)

Fédération pour la Formation Doctorale en Fusion Magnétique

(Start: 1 September 2008)

- **L'Université de Provence Aix-Marseille**
- **L'Université de la Méditerranée Aix-Marseille II**
- **L'Université Paul Cézanne Aix-Marseille III**
- **L'Université Henri Poincaré Nancy I**
- **L'Université de Nice-Sophia Antipolis**
- **L'Université Pierre et Marie Curie Paris VI**
- **L'Université Paris-Sud Paris XI**
- **L'Ecole Polytechnique**
- **Le Commissariat à l'Energie Atomique (CEA)**

European Doctoral College in Nuclear Fusion Science & Engineering : *objectives*

- Selection of students
- Selection of doctoral thesis topics
- Relations with participating home institutions and supervisors; **Joint Doctorates**
- Organization of education and training activities in close link with FUSENET
- Contacts with other doctoral initiatives aiming at establishing a unique European Doctoral network in fusion science

Financial means

- The Home Institutions of the doctoral students are committed to finance the participation of their students in the education activities organized by the College.
- The College will seek the complementary financing necessary for its operation, for the organization of the education and training activities, and for doctoral fellowships.
- FUSENET
- ERASMUS MUNDUS II

ERASMUS MUNDUS II (2009-2013)

OBJECTIVES: OVERALL AIMS

- Enhance the quality of European higher education
- Promote dialogue and understanding between peoples and cultures through cooperation with third countries (3C)
- **Promote EU external policy objectives and the sustainable development of 3C in the field of higher education (new)**

PROGRAMME DESIGN: ACTION 1

- ✓ **Joint (integrated) master programmes (150 programmes in 2013)**
 - ✓ Offered by HEIs in at least three EU countries
 - ✓ HEIs in 3C may participate [new!]
 - ✓ Joint admission, selection and exam criteria
 - ✓ Obligatory mobility between partner institutions
 - ✓ Award of double, multiple or joint degrees
 - ✓ Joint degrees are promoted
 - ✓ Programmes selected for five years
 - ✓ Increased weight on quality assurance and monitoring [new!]

- ✓ **Joint (integrated) doctoral programmes [new!]**

FUSENET (FUSion Education NETwork)

- Start of the European FUSENET initiative in October 2008 aiming at establishing a European Fusion Education Network for education in fusion science & technology.
- FUSENET project is an integrated fusion education system (from secondary school through Bachelor and Master level, to PhD) in Europe, with strong links between fusion institutes and higher education institutions.
- FUSENET will be the contact body between European and **non-European partner institutions** for the integrated and coordinated activities at doctorate level.

FUSENET

- Will provide a **platform for the coordination** of existing actions, the initiation, development and implementation of new EU-wide actions, and for the exchange and dissemination of fusion education information.

FUSENET

- The actions of FUSENET build upon the already strongly coordinated European Fusion Research programme, coordinated under the European Fusion Development Agreement EFDA.
- The project brings together a broad representation of the European fusion community with 36 participants from 18 countries, of which 22 Universities and 14 EURATOM Associations.

FUSENET

The project consists of four groups of coordination actions:

- the establishment and running of the FUSENET network;
- development of individual learning opportunities and common educational goals;
- development of educational materials and hands-on experiments;
- mobility support.

Action 3: Funding

- 👉 5,000 € per year per third-country institution (max. 15,000 € per year and consortium)
- 👉 Student mobility: 3,100 € per student (3 months x 700 € plus a fixed amount of 1,000 €)
- 👉 Scholar mobility: 13,000 € per scholar (3 months x 4,000 € plus a fixed amount of 1,000 €)
- 👉 Grants are paid to grantees by consortia

Steering Committee

Representative of each participating institution

Research representatives of the linked Fusion Associations

Representatives of the master consortia

Representative of the steering committee of FUSENET