

# EUROPEAN MASTER OF SCIENCE IN NUCLEAR FUSION AND ENGINEERING PHYSICS

Erasmus Mundus Master Programme jointly offered by Ghent University and partners (Aix-Marseille Université, Carlos III University of Madrid, Institut national des sciences et techniques nucléaires, The Complutense University of Madrid, Universiteit Gent, Universität Stuttgart, Université de Lorraine)

120 ECTS CREDITS – LANGUAGE: ENGLISH – DEGREE: MASTER OF SCIENCE

## COURSE CONTENT

The European Master in Nuclear Fusion and Engineering Physics (FUSION-EP) programme builds, with its wide network of universities and institutes, upon excellent competencies in the area of high-level multinational research-oriented education in fusion-related engineering physics. The programme operates in close relation to the research activities of the partners, and with a well-integrated language and cultural experience.

The studies in Engineering Physics are devoted to the technical applications of physics and strongly supported by the research activities in the different laboratories within the Consortium.

By combining the basic concepts of a degree in engineering with the essentials of an education as an engineering physicist, these studies seek to train engineers capable of performing or leading technical and scientific research in universities, research establishments or industry.

The engineering component of the studies makes the physics engineer familiar with the analysis, design and optimisation of new and existing systems, products, machines, materials etc., for which simplification to manageable system descriptions (from rules of thumb to expert systems) is essential. In the physics component the reductionist approach holds centre stage; here experiments and mathematical modelling seek to reduce physical phenomena to their very essence and to discover the physical laws applicable. Even though the approach has a more philosophical slant, the rigorous attitude is essential, and a physical theory should stand a validation by experiment.

Physics engineers are trained, first and foremost, for R&D purposes. Their wide-ranging education makes them fit for all companies and research establishments where interdisciplinary R&D requires in-depth knowledge of physics. They will constitute a substantial percentage of the large number of additional researchers required for the establishment of the EU as the best centre of excellence in the world. Both components of the studies especially qualify the physics engineer to fill executive jobs at a later stage.

## COURSE STRUCTURE

Student mobility is an inherent part of the programme structure and philosophy. Each student resides at two universities in two different countries (60 credits at university A, 60 credits in university B including the 30 credits for the master's dissertation).

Furthermore all students meet twice in the yearly summer event, once as a master 1 student and once defending the dissertation as a master 2 student. Scholar cooperation and mobility is particularly promoted by the specialised track education that implies a Joint Experimentation and Analysis session in IPP Prague and a Winter Event for all students near the ITER site, Cadarache, France.

The summer event plays a crucial role here, but this is only the yearly culmination point of contacts between the involved supervisors and/or promoters and research groups.

The two-year FUSION-EP programme is organised over four semesters. The total training programme has to amount up to 120 credits and fulfills certain requirements concerning mobility.

This ensures a master's programme with a strong common standard and a maximum flexibility to accommodate for students with different interests, language knowledge and background. EU-students can spend up to two months in one of the partner institutions in China, Russia or USA in the second master.

## > Master's dissertation

The master's dissertation is a requirement for every candidate to obtain a master's degree. The master's dissertation is an original piece of research work. It aims to develop and strengthen the research capacity skills of the students. The student selects a topic and is given guidance by a promoter or supervisor. The master's dissertation consists of a literature review part, a theoretical reflection and an original analysis of the topic.

## CAREER PERSPECTIVES

The EU fusion programme is at the forefront of international fusion research and engineering. Fusion research is entering a new phase. The construction of ITER, the Broader Approach activities, and the preparation for DEMO require an expansion of the fusion programme and a shift of the emphasis from plasma physics to engineering and nuclear materials. There is also a growing need for competences on nuclear project related issues such as project management, nuclear licensing, quality assurance, risk assessment, and management of procurement processes, as well as a need for stronger collaboration with industry. The ITER Organisation needs now graduates in project-oriented fusion technology, diagnostics, plasma heating, modelling and computing. During the subsequent operational phase, its need will evolve progressively towards experimental plasma physics and data analysis.

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## TOELATINGSVOORWAARDEN VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

### Na geschiktheidsonderzoek:

- Ba ingenieurswetenschappen: toegepaste natuurkunde
- Ba fysica en sterrenkunde
- Ba fysica

### Via voorbereidingsprogramma: (max. 90 studiepunten)

- andere Ba ingenieurswetenschappen
- Ba ingenieurswetenschappen (KMS)
- Ma industriële wetenschappen (alle)
- Ma in Engineering Technology (alle)

### TAAL

Je voldoet aan de taalvoorwaarden op basis van je Vlaams diploma.

## PRAKTISCHE INFORMATIE

### Studieprogramma:

<https://studiegids.ugent.be>

> faculteiten > opleidingstypes > ga naar de opleiding van je keuze

### Alternatieve trajecten

Meer informatie over voorbereidings- en brugprogramma's op [www.ugent.be/ea](http://www.ugent.be/ea)

volg > alles voor toekomstige studenten > voor wie al een diploma heeft

### Infomomenten

#### Masterbeurs

[www.ugent.be/masterbeurs](http://www.ugent.be/masterbeurs)

#### Infosessie

24 april 2019 - 17 u.-19 u. doorlopend, Campus Ufo, Ufo, Sint-Pietersnieuwstraat 33 - Foyer

[www.ugent.be/nl/studeren/masteropleidingen](http://www.ugent.be/nl/studeren/masteropleidingen)

### Contact

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[www.em-master-fusion.org](http://www.em-master-fusion.org)

### Meer info

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## ADMISSION REQUIREMENTS FOR INTERNATIONAL DEGREE STUDENTS

The minimum degree required is a Bachelor's degree in Physics or Engineering. Specialisation in Plasma and Nuclear Physics is advised but not obligatory. Research in Plasma or Nuclear Physics is an asset. Three recommendation letters are required. If the institute you are from is well known for the quality of its research and education in plasma physics and nuclear research, this is an asset too.

### LANGUAGE

More information regarding the required knowledge of English:  
[www.ugent.be/language/requirements](http://www.ugent.be/language/requirements)  
See also: [www.em-master-fusion.org](http://www.em-master-fusion.org)

## PRACTICAL INFORMATION

### Study programme

[www.ugent.be/coursecatalogue](http://www.ugent.be/coursecatalogue)

> by Faculty > Programme types > select your programme

### Application deadline

The Erasmus Mundus master's programmes have a specific application procedure to be started up via the specific website.  
[www.em-Master-fusion.org](http://www.em-Master-fusion.org)

### Enrolling institution

Ghent University

### Tuition fee

- Separate amounts and procedures apply.
- Payment upon enrolment is mostly settled between the programme coordinators.
- Scholarships are available for both EU and non-EU students and are awarded on a competitive basis.
- Application for enrolment and scholarships is directly through the secretariat of the programme. For programme-specific information, please contact the programme directly, through the web-link.

[www.em-master-fusion.org](http://www.em-master-fusion.org)

### Contact

Faculty of Engineering and Architecture

International Relations Officer – Degree students

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Last update: January 2019