

EUROPEAN MASTER OF SCIENCE IN NUCLEAR FUSION AND ENGINEERING PHYSICS

PROGRAMME JOINTLY OFFERED BY GHENT UNIVERSITY, THE COMPLUTENSE UNIVERSITY OF MADRID, CARLOS III UNIVERSITY OF MADRID, AIX-MARSEILLE UNIVERSITY, UNIVERSITÉ DE LORRAINE, NATIONAL INSTITUTE FOR NUCLEAR SCIENCE AND TECHNOLOGY, UNIVERSITY OF STUTTGART, CZECH TECHNICAL UNIVERSITY, PRAGUE

120 ECTS CREDITS - LANGUAGE: ENGLISH

WHAT

The European Master of Science in Nuclear Fusion and Engineering Physics (FUSION-EP), with its broad network of universities and research institutes, builds upon high-level, multinational, research-oriented education in fusion-related engineering physics. The programme operates in close relation to the research activities of the partners, offering a culturally diverse and academically engaging experience. The studies in engineering physics are devoted to the technical applications of physical theory and strongly supported by the research activities in the different laboratories within the Consortium. By combining the practical concepts of a degree in engineering with the essentials of education as an engineering physicist, these studies train engineers capable of performing, advancing and leading technical and scientific research in both research institutes and 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 and more, for which simplification to manageable system descriptions (from rules of thumb to expert systems) is essential. Although the various methods and applications are treated in the context of the technology of fusion devices, their relevance goes far beyond the domain of nuclear fusion. In the physics component, the reductionist approach holds centre stage; here experiments and mathematical modelling seek to reduce physical phenomena taking place in the plasma and in its interaction with its surroundings, to their very essence, and to discover the physical laws applicable. The rigorous attitude is hereby essential, and a physical theory should stand a validation by experiment.

While in the first master year the course content is intentionally kept relatively broad, in the second year students can select between two study tracks (track Fusion Sciences and track Fusion Technology). The programme offers plenty of room for emphasis on personal interests through a broad offering of elective courses.

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 during master 1, 60 credits at university B during master 2, including 30 credits for the master's dissertation). Furthermore, all students meet twice at the yearly Summer Event, once as a master 1 student and once defending the

dissertation as a master 2 student. The Summer Event plays a crucial role, but this is only the yearly culmination point of contacts between the involved supervisors and/or promotor and research groups. In addition, EU-students can spend up to two months at one of the partner institutions outside Europe in the second master. Scholar cooperation and mobility is furthermore promoted by the specialised tracks in master 2, as well as a Joint Experimentation and Analysis session at the Institute for Plasma Physics in Prague and a Winter Event for all students near the ITER site at Cadarache, France. The two-year FUSION-EP programme is organised over four semesters. The total training programme has to amount to 120 credits and fulfill certain requirements concerning mobility. This ensures a master's programme with a strong common standard and maximum flexibility, to accommodate students with different interests, language knowledge and background.

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 skills of the students. The student selects a topic and is given guidance by one or more supervisors. The master's dissertation consists of a literature review part, introduction and discussion of the theoretical background and an original analysis of the topic.

LABOUR MARKET

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 one of the main centres of excellence in the world. Both the engineering and physics components of the studies especially qualify the physics engineer to fill executive jobs at a later stage. A significant part of the programme's graduates chooses to deepen their training in the field of nuclear fusion by pursuing a PhD degree and possibly a research career. The EU fusion programme is at the forefront of international fusion research and engineering. Moreover, fusion research is entering a new phase with the ongoing construction of ITER and the preparation for demonstration power plants. This is accompanied by a gradual shift of the emphasis of fusion activities from plasma physics to engineering and nuclear materials. There is also a growing need for

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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 tendency towards stronger collaboration with industry. Finally, private investment in fusion R&D is currently booming, with (start-up) companies all over the world pursuing their own, accelerated tracks to the development of fusion energy.

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TOELATINGSVOORWAARDEN VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

1 Na onderzoek van de bekwaamheid van de student om de opleiding te volgen:

a opleidingen nieuwe structuur:

- Bachelor in de fysica
- Bachelor in de fysica en de sterrenkunde
- Bachelor in de ingenieurswetenschappen, afstudeerrichting: toegepaste natuurkunde
- Bachelor in de ingenieurswetenschappen: toegepaste natuurkunde

b opleidingen oude structuur:

- Burgerlijk natuurkundig ingenieur

2 Op voorwaarde van toelating door de inrichtende faculteit: na het met succes voltooien van een voorbereidingsprogramma:

aantal studiepunten te bepalen door de faculteit

a opleidingen nieuwe structuur:

- Bachelor in de ingenieurswetenschappen (KMS)
- Een diploma van 'Master in Engineering Technology'
- Een diploma van een opleiding 'Bachelor of Science in de ingenieurswetenschappen' (met inbegrip van 'architectuur')
- Een diploma van een opleiding 'Master of Science in de industriële wetenschappen'

b opleidingen oude structuur:

- Een diploma van 'Industrieel Ingenieur'

Additional Information on Admission (Flemish Degree)

Holders of one of the above-mentioned diplomas can apply for the programme via the FUSION-EP website: <https://www.em-master-fusion.org/>. Application is possible within the period indicated on the website (for enrolment in the academic year 2023-2024: from 15 November 2022 to 15 February 2023). Study results and motivation are some of the important selection criteria. Specialisation in plasma physics or nuclear engineering is not required, but can be an asset. Three recommendation letters are needed.

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LANGUAGE REQUIREMENTS

Language requirements Dutch: no language requirements

Language requirements for this study programme differ from the required standard level for English taught study programmes as specified in the Ghent University Education and Examination Code:

English: TOEFL 94 (internet-based) - IELTS: 7.0 (with a minimum of 6.0 for each part) - Cambridge Certificate of Proficiency in English (CPE), grade C1 (CAE). English tests results provided by universities are not considered a sufficient proof.

Prospective students who can prove that they have followed a comprehensive English-based instruction at an institute for higher education during at least two years (students may be recognized as having completed 120 ECTS) are exempted from this requirement.

PRACTICAL INFORMATION

Study programme

studiekiezer.ugent.be/european-master-of-science-in-nuclear-fusion-and-engineering-physics-EMFUSI-en/programma

Information sessions

Graduation Fair

afstudeerbeurs.gent/en/students/further-studies

Enrolling institution

Ghent University, National Institute for Nuclear Science and Technology, Aix-Marseille University, Université de Lorraine, Czech Technical University, Prague, University of Stuttgart, The Complutense University of Madrid, Carlos III University of Madrid
Information on enrolment at Ghent University.

ADMISSION REQUIREMENTS FOR INTERNATIONAL DEGREE STUDENTS

The minimum degree required is a Bachelor's degree in physics or engineering. Candidates can apply for the programme via the FUSION-EP website: <https://www.em-master-fusion.org/>. Application is possible within the period indicated on the website (for enrolment in the academic year

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Application Deadline (for International degree students)

The Erasmus Mundus Master programmes have a specific application procedure to be started up via the specific website.

Tuition fee

More information is to be found on: www.ugent.be/tuitionfee

Contact

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www.em-master-fusion.org