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 IN PRAGUE

120 ECTS CREDITS - LANGUAGE: ENGLISH

WHAT

With its broad network of universities and research institutes, the European Master of Science in Nuclear Fusion and Engineering Physics (FUSION-EP), builds on high-level, multinational, research-oriented education in fusion-related engineering physics. The curriculum resonates closely with the research activities of the partners, offering a culturally diverse and academically engaging study experience.
The Nuclear Fusion Engineering Physics programme is devoted to the technical applications of physical theory and strongly supported by the research activities at 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, the programme delivers engineers capable of performing, advancing and leading technical and scientific research in research institutes as well as and the industry.
The curriculum's engineering component familiarises the engineering physicist 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 far exceeds the domain of nuclear fusion. In the physics component, the reductionist approach takes centre stage: by means of experiments and mathematical modelling we seek to break down physical phenomena taking place in the plasma and in its interaction with its surroundings, to their very essence, and to discover the applicable physical laws. A rigorous attitude is essential, as any physics theory should stand a validation by experiment.
While we intentionally keep the learning contents relatively broad in the first-year curriculum, the second-year curriculum becomes more specialised. Students can choose one of two study tracks (Fusion Sciences or Fusion Technology). In addition, the curriculum leaves ample room for the students' personal interests by means of a broad set of electives.

STRUCTURE

Student mobility is an inherent part of the programme structure and philosophy. Each student resides at two universities in two different countries (sixty credits at one university during the first year, and sixty credits at another university during the second year, including thirty credits for the Master's dissertation).
Furthermore, our students all meet each other on two fixed occasions in the course of their two-year programme, i.e. the annual Summer Event. Students attend this event as first-year students and then again as second-year and graduating students when they defend their Master's dissertation. Although our Summer Event clearly plays an important role in the curriculum, it is only the annual high-water mark of the contacts between every party involved: the supervisors and/or promoters, as well as the research groups. In their second year, EUstudents can additionally spend up to two months at one of the partner institutions outside Europe . Academic collaboration and mobility is further promoted by the specialised tracks in the second-year curriculum, 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 comprises four terms. The study programme as a whole has to amount to 120 credits and fulfil certain mobility requirements. These requirements ensure 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

Completing the Master's dissertation is a requirement for any student who wants to obtain their Master's degree. The Master's dissertation is an original piece of research. Its aim is to develop and strengthen the students' research skills. Students select a topic and receive guidance from a supervisor. The Master's dissertation consists of a literature review, practical research, and an original analysis of the chosen topic.

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LABOUR MARKET

Physics engineers are trained, first and foremost, for R&D purposes. Their broad education makes them fit for employment at 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. The curriculum's engineering and physics components especially qualify the physics engineer to take up executive positions at a later stage of their careers.

A significant number of our 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 competencies 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 the industry. Finally, private investment in fusion R&D is currently booming, with (start-up) companies all over the world pursuing their own, accelerated tracks towards 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.

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 2023-2024: from 15 November 2022 to 15 February 2023).
Quality of the institute where you studied, 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.

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

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FACULTY OF ENGINEERING AND ARCHITECTURE

2025-26

Enrolling institution

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

Information on enrolment at Ghent University.

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

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GHENT UNIVERSITY

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