ASIIN Seal & EUR-ACE® Label

Accreditation Report

CMI Programme
Hydrogen Energy and Energy Efficiency

Provided by
University Marie and Louis Pasteur

Version: 27 June 2025

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Cursus Master en Ingénierie Hydrogène-Energie, Efficacité Energétique	Master's degree in Engineering Hydrogen Energy, Energy Efficiency	ASIIN, EUR-ACE® Label	Réseau Figure®, 2019-2024	01, 02
Date of the contract: 17.07.2023 **Submission of the final version of the self-assessment report:** 01.11.2023 **Date of the onsite visit:** 06.-07.01.2025 **at: Université Marie and Louis Pasteur, Campus Belfort**				
Expert panel: Dr. Julia Mainka, University of Lorraine Prof. Dr.-Ing. Sergej Diel, Technical University of Applied Sciences Ingolstadt Dipl.-Phys. Philipp Dedié, PhDSoft Coraline Leroux, University of Reims Champagne-Ardenne				
Representative of the ASIIN headquarter: Sascha Warnke				
Responsible decision-making committee: Accreditation Commission for Degree Programmes				
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015				

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes.
[2] TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology.

Subject-Specific Criteria of Technical Committee 01 – Mechanical Engineering/Process Engineering as of December 9, 2011 Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering/Information Technology as of December 9, 2011 EURACE Criteria	

B Characteristics of the Degree Programme

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double / Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
CMI Hydrogen Energy & Energy Efficiency	• License mention sciences pour l'ingénieur (Bachelor of Engineering Science), after 3 years • Master Énergie – Énergie électrique (Master of Electrical Engineering); or • Master Énergie – Ingénierie thermique et énergie (Master of Thermal Engineering and Energie)	• Electrical Energy • Thermal Engineering and Energy	7	Full time	/	10 semesters	360 ECTS	01 September 2014

[3] EQF = The European Qualifications Framework for lifelong learning

Marie and Louis Pasteur University, formerly known as the University of Franche-Comté, is a multidisciplinary public institution located in the Bourgogne-Franche-Comté region of eastern France. While the university offers a broad range of academic programmes in science, technology, health, and the humanities, it faces structural and reputational challenges common to many French universities. Despite efforts to foster research activity and international collaboration, it operates within a system where universities are often perceived as less prestigious than the Grandes Écoles, particularly in engineering education.

In September 2014, the university introduced the Master's degree programme in Hydrogen Energy & Energy Efficiency (H3E) within the framework of the Cursus Master en Ingénierie (CMI). The CMI is a specialised track intended to mirror the structure of engineering programmes, combining Bachelor's and Master's studies over a five-year period. It includes additional coursework beyond the standard curriculum, designed to enhance students' technical and professional competencies. However, the CMI model remains less recognised compared to degrees awarded by accredited Engineering Schools, and its graduates do not receive the legally protected title of "engineer" unless the programme is CTI-accredited—something not typically available to university-based tracks.

The university's decision to seek international accreditations such as ASIIN and EUR-ACE reflects an attempt to improve the programme's external credibility and align it more closely with recognised engineering standards. This move also highlights the ongoing disparities in the French higher education system, where only Engineering Schools are permitted to award the title of engineer through the Commission des Titres d'Ingénieur (CTI), placing university programmes at a structural disadvantage regardless of academic content or rigor.

C Expert Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, Content & Implementation

Criterion 1.1 Objectives and Learning Outcomes of a Degree Programme (Intended Qualifications Profile)

Evidence:

- Self-assessment report
- Website of the Faculty and Programme
- Diploma Supplement
- Objective module matrix
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The experts refer to the respective ASIIN Subject-Specific Criteria (SSC) of the Technical Committees 1 (Mechanical Engineering and Process Engineering) and 2 (Electrical Engineering and Information Technology), the objective-module-matrix for the degree programme, the matching learning objectives and the modules as a basis for judging whether the intended learning outcomes of the programme correspond with the competences as outlined by the SSC. The descriptions of the qualification objectives are comprehensive and include the achieved competencies and possible career opportunities of the graduates.

The university initiated the CMI H3E Programme in 2013-2014 due to a lack of hydrogen energy-focused engineering courses in France. It is offered by University of Marie and Louis Pasteur, in Belfort, through the Faculty of Sciences, Technologies, and Industrial Management (STGI) and has defined the following Specific Learning Outcomes (SLO) that are intended for graduates to achieve by the end of their studies:

> **SLO1** Acquire conceptual knowledge of Energy in general and Hydrogen Energy and energy efficiency in particular.

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

SLO2 Analyse complex engineering Hydrogen based Energy Systems and formulate working hypothesis according to the field of application, methods, and computational models, as well as experimental Approaches to validate them.

SLO3 Knowledge-based Design, application and experimental methods for hydrogen-based energy systems for energy efficiency.

SLO4 Research, investigation and critical analysis of complex hydrogen-based energy systems.

SLO5 Conduct methods to analyse hydrogen-based systems, apply new designs and architectures in simulation and experimental methods to design and validate complex hydrogen system.

SLO6 Being Able to analyse potentialities of the hydrogen & Energy efficiency solutions, their benefits for the society, having adapted strategies for decision-making.

SLO7 Being able to use the learning skills acquired to adapt to new findings and situations by undertaking autonomous learning, investigations and studies.

Next to these, the curriculum is structured around 14 generic learning outcomes defined by the Réseau Figure®, which can be consulted in the annex to this report. According to the Self-Assessment Report this structure ensures compatibility with the EUR-ACE® engineering accreditation framework, as well as with relevant Subject-Specific Criteria (SSC). An Objective-Module Matrix facilitates alignment between learning outcomes and individual modules, using a scale from 0 to 3 to indicate the degree of contribution.

Development of the curriculum and associated competencies has been carried out collaboratively by academic staff from the departments of energy and engineering. These were subsequently validated through consultations with students, academic representatives, and industrial stakeholders. Feedback mechanisms are in place through annual evaluations, allowing for adjustments to the delivery and focus of the programme.

The curriculum undergoes regular revisions informed by internal discussions, external stakeholder input, and developments in the Réseau Figure® standards. Enhancements have included stronger links with industry, the integration of entrepreneurial components, and the inclusion of professional practitioners in course delivery.

Graduate outcomes indicate the programme's relevance to the employment market. Between 2019 and 2022, nine students completed the programme: one launched a hydrogen-related business, four secured employment in the hydrogen energy sector, and four pursued doctoral studies in related areas—two of whom are now senior research engineers.

Overall, feedback from students and industry partners has been positive, with both parties affirming the relevance and applicability of the skills and knowledge acquired. Internships and collaborative projects with companies play a central role in reinforcing the practical dimension of the training, contributing to strong employability outcomes for graduates.

In preparation for the audit, the expert team reviews the documentation provided by the university. Although the institution states that the learning outcomes are publicly accessible via several platforms—including the faculty website, the programme's website, and that of Réseau Figure®—the assessors are unable to locate them. While brief summaries of the intended skills are available, the specific learning outcomes are not clearly stated. Furthermore, the sample Diploma Supplement presents learning outcomes that appear to be inconsistent with those outlined in the Self-Assessment Report. All this might be due to a recent restructuring of the programme and the whole university; nonetheless, the expert team identifies a need for ensuring consistent and transparent presentation of the official learning outcomes across all relevant documentation.

In addition to the findings outlined above, the expert team acknowledges that the defined learning outcomes reflect the thematic focus of the programme appropriately and appear to be well integrated into the overall curriculum. During the audit process, the involvement of various stakeholders in the development and periodic review of these outcomes becomes evident. Representatives from academic staff, students, and industry partners were able to articulate their respective roles in shaping the learning objectives. This level of engagement indicates a strong and constructive collaboration across sectors, which the expert team views as a particular strength of the programme.

Since the university also applied for the EUR-ACE® label for both programmes, the experts check whether the learning outcomes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG) for engineering programmes. The EUR-ACE® Framework Standards and Guidelines requires that engineering programs cover the following seven competence areas: Knowledge and Understanding, Engineering Analysis, Engineering Design, Investigations, Engineering Practice, Making Judgements Communication and Teamworking, and Lifelong Learning. The self-assessment report and the module descriptions illustrate that the degree programme under review covers all the required competence areas such as engineering analysis, design, and practice as well as communication and teamworking skills. The experts are convinced that the mentioned competences are conveyed in the respective courses. They conclude that the intended learning outcomes of the programme are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG).

Criterion 1.2 Name of the Degree Programme

Evidence:

- Self-Assessment Report
- Documentation of the programme
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The French programme title "Cursus Master en Hydrogène Énergie, Efficacité Énergétique (H3E)" has been officially validated by the University since its inception. The inclusion of "CMI" has been explained in the beginning of this report. The designation H3E is supposed to effectively capture the interdisciplinary focus of the programme, which spans energy systems, hydrogen technologies, and energy efficiency.

The university claims that the terminology used in the programme name aligns with that of the subject-specific academic and industrial communities. Terms such as "Energy," "Hydrogen," and "Energy Efficiency" are widely recognised and reflect established areas of expertise. According to the programme coordinator, the programme name has been well received by stakeholders over the past decade, including students, employers, and researchers. There is no indication of confusion or misinterpretation regarding the scope or content of the programme. The name is considered an accurate representation of the intended learning outcomes and professional profile it aims to develop. While there is a theoretical possibility that some terms—such as "hydrogen energy" or "energy efficiency"—might be associated with disciplines outside the programme's scope (e.g. materials science), no such misunderstanding has been reported. Clear communication by the programme team helps mitigate this risk.

The assessors look through the documentation and confirm that the French programme names are used consistently across sources. Furthermore, the names appropriately reflect the structure, learning outcomes, and curricular content of the programme.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment report
- Study plans for both specialisations
- Objective module matrix
- Module handbooks
- Statistical data about student mobility

- Discussion during the audit

Preliminary assessment and analysis of the experts:
Content and structure

The CMI Hydrogen Energy & Energy Efficiency is a five year's programme that structurally functions like the respective Bachelor's and Master's degree programmes, which the university offers as well. Next to the standard courses to be undertaken by all students, the CMI programme offers special courses for students of this programme.

In the first four semesters, students learn the basics of the study programme and can then choose between two pathways, either "Thermal Engineering and Energy" or "Electrical Engineering" which will affect the specialisation courses that the students will take from the fifth semester onwards.

Semester I provides a broad scientific foundation across key disciplines. Core modules include Mathematics (Algebra and Analysis), Physics (Electricity and Thermodynamics), Chemistry, and Engineering Sciences, introducing students to Electrical and Electronic Architecture, Mechanical Systems, and Programming. A module on the Methodology of Science and Academic Work enhances skills in digital literacy, scientific method, documentation, and English. Professional Integration and an initial work placement offer early exposure to real-world environments.

Semester II builds on this foundation with Mathematical Tools, Engineering Sciences (Automation and Electro-Kinetics), and Newtonian Physics. Further modules explore Mechanics and Engineering, reinforcing applied physical knowledge. A Cross-disciplinary component addresses socio-ecological issues, career planning, and language skills. Additional development is provided through Professional Integration and Laboratory R&D, fostering practical and communication skills.

Semester III introduces more applied content. Mathematics and IT are further developed to support computational approaches. Engineering Sciences focus on Structural Design and Solid Mechanics, while Physics and Energy explores Thermodynamics and Fluid Mechanics. Modules on Automation and Electronics support knowledge of electrical systems. A Cross-disciplinary programme, including project work and English, encourages transferable skill development. Students also engage with International Relations and begin subject specialisation with Electrochemistry.

Semester IV consolidates technical competencies and bridges academic and industrial practice. Advanced study in Mathematics and IT supports modelling and simulation. Modules in Industrial Computing and Automation link theory to practice. Physics and Energy topics include Radiation Physics and Heat Transfer, while Electrical Engineering and Electromagnetism reinforce knowledge of modern electronic systems. A Cross-disciplinary module focuses on corporate culture, general awareness, and project work. The semester concludes with modules in Chemistry and Laboratory R&D, maintaining an emphasis on practical experimentation.

Students who choose to specialise in *Thermal Engineering and Energy* follow this curriculum: The programme begins with Applied Mathematics, focusing on numerical methods and tools essential for engineering analysis. Core topics in Thermodynamics and Energy Conversion introduce students to fundamental and advanced thermal processes. Complementary modules in Transfers and Flows cover conduction, convection, and fluid dynamics. Students gain practical skills through Instrumentation and Industrial Computing, including sensor technologies, metrology, and computing for engineers. Professional preparation is supported by training in English, Career Planning, and Project Management, along with specialised topics such as Cogeneration and Dimensional Analysis.

Subsequent modules in Information Processing, Automation, and Thermal Systems expand technical capability, including electrical energy conversion and mechanical systems. The study of Advanced Transfers explores unsteady conduction, radiation, and viscous flows. Application is reinforced through a Housing Heat Engineering Project and an initial Industrial Placement.

The following phase includes modules on Fluid Mechanics, CFD, and Transfer Phenomena such as two-phase flow and heat exchangers. Students study Engineering Systems like refrigeration and acoustics, while a major Integration Project explores Hydrogen Energy and Thermal Management.

Later modules emphasise the Economics of Energy Transition, Energy Production (combustion, nuclear, hydrogen), Energy Modelling, and Energy Efficiency in systems and buildings. Students develop applied research skills and complete a second Integration Project focused on Energy Conversion, Grids, and Storage.

In the final stage, students engage with Digital Engineering tools (simulation, CAD), explore Thermal Systems in conventional power generation, and study Advanced Energy Systems including metrology and exergy analysis. A final Integration Project focuses on Clean and Sustainable Energy Production, with applications in advanced cogeneration, fuel cells, and hydrogen production. The programme concludes with a professional Industrial Internship, offering experience in management, engineering, environmental, and societal contexts.

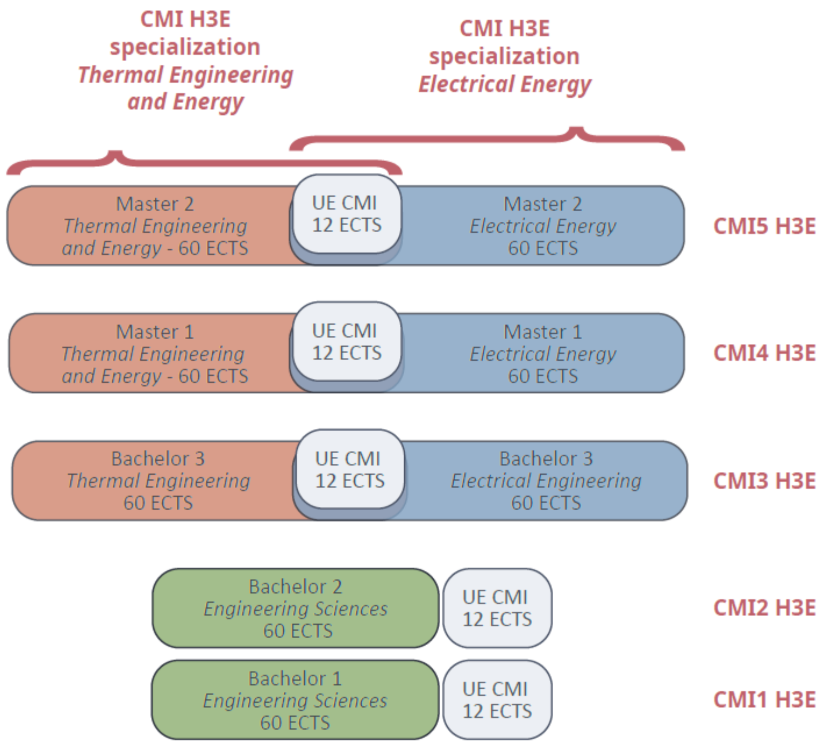
Students specialising in *Electrical Engineering* follow a curriculum designed to build advanced technical competence in energy systems, electronics, and control. The programme begins with Applied Mathematics (numerical methods and engineering-focused mathematics) and Applied Physics, covering Electronics and Electromagnetism. These form the analytical base for further study. Core engineering modules such as Electrical Energy Conversion (power electronics and electrical engineering) and Instrumentation and Industrial IT (sensors, measurement, and computing) introduce students to key concepts in power systems and industrial automation. Professional competencies are developed through modules in English, Career Planning, and Project Management, with reinforcement topics like Cogeneration and Dimensional Analysis enhancing interdisciplinary insight.

As students progress, they explore Signals and Systems, including Signal Processing, Automation, and Control Theory, alongside Thermal and Mechanical Systems, covering mechanical dynamics and component heat transfer. Electrical Energy Technology and Storage deepens understanding of modern energy technologies and their practical applications. A substantial Integrative Project and an initial Industrial Placement provide applied experience.

In the subsequent stages, students study Electrical Actuators, Power Electronics, and Automatic Control, enabling them to work on control and conversion systems. A major Integration Project themed around Hydrogen Energy and Energy Systems allows application of knowledge in areas such as Fuel Cells, Thermal Management, and Electric Power Chains. Students continue to explore contemporary challenges through modules on Economics of the Energy Transition, Project Management, and H2 and Energy Storage. Specialised courses in Electric and Hybrid Drivelines and Power Plants and Renewable Energies broaden their exposure to mobility and generation technologies. A second Integration Project focuses on Energy Efficiency, Conversion, and Storage.

In their final academic phase, students address advanced topics including Modelling and Control of Energy Systems, Artificial Intelligence for Energy Applications, and the Development of Multi-Physical Models using analytical and numerical methods. A final Integration Project focuses on Clean and Sustainable Energy Production, with topics such as Advanced Cogeneration, Fuel Cells, and Hydrogen Electrolysis. The programme concludes with an extended Professional Internship, offering practical experience in engineering, management, environmental impact, and broader societal contexts.

These paths are condensed in the following picture, highlighting the tracks and CMI courses next to the regular Bachelor's and Master's degree:



1Full curriculum of CMI H3E, taken for the self-assessment report, p.34.

Students typically complete three to four internships (CMI1, CMI3, CMI5, and an optional placement), amounting to approximately 11 months of professional experience. A minimum of 14 weeks in a company is strongly encouraged. Alongside this, tutored projects run from CMI1 to CMI5, allowing students to progressively develop both disciplinary and cross-cutting competencies such as project management, teamwork, and communication, typically in groups of 4–6. Each internship and project is guided by a charter that outlines expected milestones and targeted skills, which become increasingly advanced as students progress. Internships require prior approval by designated academic staff. Projects are often proposed by teacher-researchers and align with ongoing research activities in partner laboratories. Evaluation includes a written report and an oral defence before a jury comprising referees and teaching staff. Feedback on both report and defence is provided, and students are given clear guidance on writing standards and assessment criteria from the outset.

Additionally, the programme has been opened in 2019 to the “alternance” system, which combines academic study with professional experience in a company. Students alternate between periods of university-based learning and time spent working within an organisation, following a predetermined schedule. Under this model, the student typically holds a formal employment contract, such as an apprenticeship or professionalisation agreement, and receives a salary for the duration of the arrangement. Alternance is introduced during the last two years of the CMI programme, once students have acquired a strong academic foundation. It offers the dual advantage of consolidating theoretical knowledge through practical application while also easing the transition into the professional world. For students, this means not only gaining valuable work experience in their field but also benefiting from financial support, as the company often covers tuition fees or related costs.

During the audit, the assessors engage with various stakeholders to review the structure and content of the programme. They conclude that the CMI provides students with numerous opportunities, including multiple internship options, two distinct study tracks, and the possibility of combining study with work. This flexibility, however, entails a significant workload in terms of programme planning. Despite this, the assessors observe that the university's responsible staff are fully committed to the programme and actively involved in a close-knit community that includes the students, which they regard as a positive sign.

The assessors also learn that the module structure has recently been revised, and the new modules are not yet implemented at the time of the visit. Consequently, they hold a follow-up online meeting after the on-site audit to discuss these changes. It becomes clear that the revisions are improvements, particularly in clarifying the role of hydrogen, addressing previous concerns about vagueness that are still being debated during the audit. Therefore, the assessors conclude that the programme's content and structure fully meet the requirements for the two accreditation seals being sought. Still, they also note a lack of consistency in the naming of the specialisation tracks across the documentation. The bachelor and master specialisations are sometimes referred to with varying terminology, such as "Electrical Engineering and Energy," "Electrical Energy," or simply "Electrical Engineering," while the "Thermal Engineering" track is also occasionally labelled "Thermal Engineering and Energy." While these inconsistencies may be the result of translation errors, the assessors suggest harmonising the terminology across all materials to avoid confusion and ensure clarity for both students and external stakeholders.

<u>Student mobility</u>

According to the Self-Assessment report, the CMI H3E programme places strong emphasis on student mobility during the early years (CMI1-3), actively encouraging students to undertake internships or study semesters abroad. This international mobility is facilitated through several support mechanisms by the university, its International Relations department of the Faculty of Sciences, Technologies and Industrial Management, and the Réseau Figure® network. The latter is notable due to the International Research Experience Program (IREP), which enables students to pursue short-term research placements at partner institutions.

Between 2014 and 2019, student participation in particularly international internships was notably high, with rates of up to 80% among Bachelor-level students. However, the COVID-19 pandemic caused a significant disruption, halting international mobility from 2020 onwards. Concurrently, the introduction of the alternance at the Master’s level has restricted the ability for students to study or intern abroad.

During the audit, the programme coordinators report that, unfortunately, few students choose to study abroad, despite existing partnerships with institutions in Venice, La Réunion, and Canada—opportunities that have only been taken up by two students in the past ten years. Although seminars are organised in collaboration with the international office to promote mobility, they are poorly attended. However, during the student session, participants express a genuine interest in both internships and study abroad experiences. Students also indicate that they are largely unaware of the university’s mobility incentives, suggesting a possible communication gap. The assessors therefore recommend improving both the communication and administrative support related to international mobility, in order to make these opportunities more visible and accessible to students.

<u>Periodic review of the curriculum</u>

The assessors learn during the audit that the CMI programme undergoes a comprehensive update every five years through two main channels. Firstly, the underlying Bachelor's and Master's degrees are re-accredited at the ministerial level for five-year periods. Secondly, the CMI-specific training is also re-accredited every five years by the Réseau Figure®. In 2019, this process was conducted in alignment with the re-accreditation of the diplomas and was based on a thorough self-evaluation aligned with EUR-ACE® standards and guidelines. This evaluation involved active participation from various stakeholders, including teaching staff and students.

As a result of this process, an action plan was implemented. One of its main developments was the introduction of the “alternance” system as described above. Another key development was the integration of the CMI into the EUR EIPHI Graduate School, which introduced fully English-taught modules and brought CMI students together with high-level international peers.

The assessors note that all stakeholder groups are actively involved in these periodic reviews. Student feedback is systematically collected, particularly for the SECO component, through surveys aimed at enhancing both the organisation and content of the courses. Overall, the assessors are impressed by the wide involvement of different actors in the programme’s ongoing development and receive a comprehensive overview of its evolution over the years.

Criterion 1.4 Admission Requirements

Evidence:

- Self-Assessment Report
- Website of the programme
- Information leaflet about the programme
- Statistical data about applicants and students
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The admission process for the CMI H3E programme follows the requirements set by the Réseau Figure® for both post-baccalaureate and in-course admissions. It consistently includes an initial review of each candidate's application file, followed by a personal interview if the application is accepted. All details about the admissions procedures are publicly available on the programme's website and in the official information leaflet.

At the national level, admissions are primarily managed via the Parcoursup platform, a national system for assigning places in higher education in France. The CMI H3E is a selective programme, with academic performance and motivation being the main admission criteria. Typically, fewer than 20 students are admitted per year to ensure sufficient support and space within the training and research environments. The selection committee, composed of a multidisciplinary team of teachers, evaluates applications based on academic results, teacher recommendations, and the motivation letter. Selected candidates are invited to a twenty-minute interview conducted by two faculty members. The purpose of the interview is to assess the candidate's alignment with the programme's objectives, including readiness for simulation activities or potential for international mobility. International admissions for candidates with equivalent qualifications are managed via the Études en France platform and evaluated by the same selection committee, ensuring the consistency of the criteria applied.

Exceptional admissions, such as those into third or fourth year, are allowed under specific circumstances, including for students with relevant foreign diplomas or non-Réseau Figure® accredited backgrounds, provided their training aligns with the programme requirements. Students from preparatory classes for elite schools (CPGE) may also apply. These applicants are assessed through academic records and interviews, and, if successful, are placed at the appropriate level in the curriculum.

The current admissions system is considered highly effective by the university, with the vast majority of students proving well-suited to the CMI H3E programme. Over 80% of admitted students hold a scientific baccalaureate with at least a "Fairly Good" distinction. As a result, exclusions due to academic mismatch are rare. While repeating a year is not standard practice, students who exit the CMI are not penalised, as they can seamlessly continue within the regular Bachelor's or Master's programme without losing time. Recruitment data since 2019 reflect a stable and selective process, with a clear increase in interest and candidate numbers over time.

The assessors agree that the admission regulations can be considered highly effective. The system is clear and transparently described on the relevant websites.

Criterion 1.5 Workload and Credits

Evidence:

- Self-Assessment Report
- Modul handbooks
- Study plans
- Data on the distribution of ECTS
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The workload of students in the CMI H3E programme is structured according to the European Credit Transfer System (ECTS). Each semester is worth 36 ECTS, corresponding to approximately 16 to 18 weeks of instruction. Based on an estimated 50 hours of total student work per week—including both face-to-face teaching and independent study—this results in an average workload of 800 to 900 hours per semester.

Each ECTS credit represents around 25 hours of total student work, typically comprising 10 hours of classroom instruction and 15 hours of personal study. This balance may vary depending on the level of study: In the early years of the programme, classroom instruction is more prominent, while in years four and five, students are expected to engage in more autonomous or group-based projects. Consequently, the ratio shifts in favour of personal work, reflecting the increasing emphasis on project-based and research-oriented learning at the Master's level.

The workload related to internships is adapted to the duration and intensity of the tasks required, with the ECTS allocation adjusted accordingly. Similarly, for individual assignments and lab-based projects, the required workload is determined by the teaching team, and the number of face-to-face hours increases as the student progresses through the curriculum.

As part of the evaluation, the assessors examine the module handbooks and the programme's study plan. They find that the workload is well distributed across the semesters, with no structural peaks or imbalances. The internal documentation provides detailed information on the allocation of ECTS credits per module and the breakdown between classroom instruction and independent study. Although the overall workload is higher than in standard programmes this is consistent with the expectations of an intensive curriculum like the CMI. Importantly, students are aware of these demands and confirm during interviews that they are able to manage their workload. They also highlight the strong support they receive from their teachers, which helps them maintain a healthy balance and stay on track with their studies.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Self-Assessment Report
- Module handbooks
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The CMI H3E programme employs a structured teaching methodology combining lectures, application-based courses, and practical sessions. These are complemented by project work and internships, providing students with opportunities to reinforce theoretical knowledge through hands-on experience. Independent academic work is encouraged throughout the curriculum, particularly in the form of laboratory visits, research internships, and long-term integrator projects. The programme also places importance on the development of transversal skills such as communication, teamwork, and critical analysis. Students engage with scientific literature and are encouraged to evaluate research methodologies and experimental design. A significant portion of the curriculum (estimated at 24–30%) consists of project-based modules. These are typically assessed through written reports and oral presentations, often evaluated by multidisciplinary panels.

Pedagogical practices are continuously reviewed and updated through feedback from student surveys, consultations with the CMI improvement council, and input from the university's teaching and certification support unit (SUP-FC). The programme coordinators name as recent developments the integration of Moodle for document distribution and assessments, expanded use of multiple-choice tests, and increased application of blended learning strategies.

All in all, the assessors are very satisfied with the teaching methods used in the programme. Students report that the didactical approach varies among the modules. There are many individual assignments and laboratory praxis, next to several internships.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 1:

[…]

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, Concept and Organisation

Evidence:

- Self-Assessment Report
- Module handbooks
- Examination methods
- Perusal of exemplary examinations and theses
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The CMI H3E programme wants to emphasise the alignment of learning objectives, evaluation methods, and learning activities at both module and programme levels. For each teaching unit, learning outcomes are defined in terms of knowledge, skills, and competencies. These outcomes are then assessed through varied examination formats, including written reports, table-top exams, project or internship evaluations, and oral presentations. In specific project-based modules, role-playing and simulated real-world tasks are key components of the assessment.

Examination methods are determined by the responsible teaching staff of each module and are aligned with the learning outcomes and instructional approach. Detailed examination procedures for each course are documented internally. Assessments are both formative and summative, with continuous assessments taking place during the semester and final exams scheduled at the end. Intermediate exams offer students feedback on their progress and allow for self-regulated adjustments prior to final evaluations. Students are informed at the beginning of each module about the assessment formats and schedules.

Projects and internships are evaluated using predefined guidelines and assessment grids provided to students at the outset. These evaluations are transparent and typically include both written reports and oral presentations. Oral feedback sessions are often conducted after project defences. These assessments emphasise the development of transversal skills, including written and oral communication, bibliographic research, and project management. Assessment criteria are communicated to students in advance and compiled in a central document accessible via the university website. Examination calendars are managed by the university's academic services, with students typically receiving notice two weeks before exams (one week for resits), and usually benefiting from a dedicated review period beforehand.

During the audit, the assessor team peruses exemplary examinations and theses written by the students. They confirm that the examinations adhere to the respective EQF of 6 or 7. In general, the assessors consider the examination system to be fully satisfactory. The programme coordinators report some changes that have taken place, e.g. adjustments to the schedule at some semester ends, where report deadlines previously coincided with examination periods. These changes show that the feedback system between student, teachers, and coordinators work very well, which the assessors welcome very much.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 2:

[…]

3. Resources

Criterion 3.1 Staff and Development

Evidence:

- Self-Assessment Report
- Staff handbook
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The teaching staff comprises 10 university professors, 7 lecturers, one research engineer, and 14 associate professors. All teaching staff at the University are recruited competitively after evaluation by a selection committee, ensuring their qualifications for both higher education and research within their respective fields.

The university supports continuous professional development through the "Service Universitaire de Pédagogie pour les Formations et la Certification" (SUP-FC), which offers regular training to teaching staff. Additionally, Réseau Figure® organises specialised courses, such as problem-based and project-based learning workshops.

Technical and administrative support staff play a vital role in the programme's operation. Librarians assist students with bibliographical research, guidance counsellors support students' personal and professional projects, and technical personnel aid in laboratory activities. Contributions of these staff members are formally recognised in their service records and during annual performance reviews.

The assessors note that, given the small cohort size, the current number of teaching staff is sufficient to cover the CMI H3E programme's needs effectively. However, during the audit, they observed that a significant amount of technical work, which would typically be the responsibility of laboratory technicians, is instead being performed by professors and other teaching staff. This situation is not optimal as it may detract from the teaching and research duties of academic personnel. Despite this being possible it is advised to recruit additional laboratory technicians to better support the programme's technical requirements and to allow teaching staff to focus more fully on their core academic responsibilities. This is especially due to the fact that the workload is already quite high for the professors who conceptualise and execute different modes of study, study tracks, and student counselling.

Criterion 3.2 Student Support and Student Services

Evidence:

- Self-Assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, all students in the CMI H3E programme benefit from dual academic mentoring: each student is supported by both a year coordinator and the overall CMI coordinator. The relatively small size of the Energy department facilitates close, direct relationships between teachers and students, enabling mentors to provide personalised advice and guidance throughout students' academic journeys.

This individualised support allows mentors to tailor their assistance to each student's specific challenges, which may range from choosing a specialisation, finding internships, to overcoming difficulties in particular subjects. Peer interactions between different student cohorts also serve as an important informal support network, especially benefiting younger students.

Occasionally, mentors help address more personal issues as well. The trusting relationships established between students and mentors enable the resolution of approximately 90% of student concerns. In cases involving more serious difficulties, the CMI or year coordinator directs students to relevant university support services, including administrative and social assistance.

The assessors note the strong, close-knit community within the student body as well as between students and teachers. They consider the mentoring system effective, particularly due to the small cohort sizes which facilitate personalised attention. Students also report the existence of an alumni platform that allows current students to contact graduates for advice. This alumni network is actively used to support students, especially in finding internships.

Criterion 3.3 Funds and equipment

Evidence:

- Self-Assessment Report
- Tour of the facilities
- Discussion during the audit

Preliminary assessment and analysis of the experts:

Participants in the CMI H3E programme benefit from comprehensive campus infrastructure, including lecture halls, supervised and practical workspaces, computer labs, language laboratories, and access to experimental platforms. Educational resources such as the on-campus library network, digital workspace services (ENT, Moodle), scheduling tools (ADE), and academic collaboration platforms (Filesender, Evento) are also readily available. The campus is equipped with high-speed internet and widespread Wi-Fi access, supported by an IT department that assists students in need of computer equipment.

The CMI H3E programme is co-sponsored by the FEMTO-ST laboratory and the FCLAB research federation. Both institutions possess competitive French and European-level experimental facilities specializing in hydrogen energy and energy efficiency studies. These high-quality research infrastructures, recognised by the national evaluation body HCERES, are made accessible to students during projects, internships, and training activities. The laboratories are actively involved in excellence projects, international publications, patent filings, and knowledge dissemination.

The programme manages a dedicated pedagogical budget used to acquire small equipment (e.g., headsets, calculators), support services (such as website updates and webinar participation), and facilitate international internships and semesters abroad. Student intake is capped at a maximum of 20 per cohort to ensure adequate accommodation in laboratory groups of 4 to 6 students.

The CMI H3E program benefits from three lecture halls where lectures are primarily conducted in person, though some courses are occasionally offered online or in hybrid formats, including joint lectures with the University of La Réunion. Several seminar rooms and computer rooms are also available, the latter for student use. The programme coordinators state that the university buildings are supposed to be relocated closer to the laboratory in the future. The assessors inspect several laboratories during the on-site visit. The mechanical engineering laboratory is well-equipped with motors and associated machinery, while the thermal engineering lab provides facilities for experiments involving temperature and pressure measurements, cooling systems, pumps, conductivity, radiation, wind and speed measurements, as well as renewable energy studies. The electrical engineering lab features instruments such as oscilloscopes for electrical testing and measurements. Additionally, the hydrogen and energy storage lab specializes in fuel cell technology and energy storage solutions.

The FEMTO-ST engineering sciences laboratory, which was established 35 years ago, hosts advanced equipment including fuel cells and stacks, energy storage systems, and real-life simulation setups. Specialised testing equipment, such as a shaker for vibration testing of fuel cells and battery pack testers, further supports student projects and research activities.

All in all, the assessors are very satisfied with the laboratories and the small cohort sizes. This means that students can acquire hands-on experience in small groups effectively throughout the study programme.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 3:

[…]

4. Transparency and Documentation

Criterion 4.1 Module Descriptions

Evidence:

- Self-Assessment Report
- Modul handbooks
- Discussion during the audit

Preliminary assessment and analysis of the experts:

As was stated earlier, the curriculum was recently overhauled meaning that the module handbook was not finished during the on-site visit. However, the programme coordinators handed in a new version shortly after the audit which the assessors came together online to discuss.

The module handbooks contain relevant information about each module by titles, the persons responsible as well as a table for workload (contact and self-study) and ECTS points awarded. It contains the contents and learning outcomes in either short texts or bullet points, as well as the admission requirements and forms or assessments. The recommended literature is missing, but this is a known issue with the digital tool used. Currently, each teacher provides the appropriate literature directly to the students during the course or in the Moodle LMS.

Since the curriculum is still new and the webpage of the whole university has recently been restructured, the current curricula for the two tracks are not yet available on the website. The assessors suggest that the university upload a current and complete list of modules for interested parties to consult.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Exemplary diploma
- Exemplary diploma supplement
- Exemplary transcript of records

Preliminary assessment and analysis of the experts:

Shortly after graduation, a diploma (degree certificate) is issued together with a diploma supplement. The latter is provided in English. While generally all relevant information is given in the diploma supplement, the learning outcomes are not aligned with those given elsewhere (see Chapter 1.1). The assessors suggest that the diploma supplements be reworked to contain the learning outcomes as well as the specialisation within the study programme.

Criterion 4.3 Relevant Rules

Evidence:

- Self-Assessment Report
- Rules and regulations
- Website of the university and the programme
- Discussion during the audit

Preliminary assessment and analysis of the experts:
At the start of their first year, each CMI student receives a specific pedagogical charter which they are required to read and sign. This charter outlines the students' commitments, the particular regulations of the CMI, and provides an overview of the modules across the five years, including their distribution among training components. The charter aligns with the policies of the Réseau Figure®. Further details are set out in the Réseau Figure® charter, which defines the commitments of all stakeholders involved: the Network members, students enrolled in a Figure Network-labelled curriculum, evaluation experts, and the Network's management board.

During the audit there appear to be no uncertainties regarding the rule among the stakeholders. The rules and regulations are published online and accessible by all stakeholders and interested parties.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 4:

[...]

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- Action plan
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The quality assurance system for CMIs, established by Réseau Figure®, comprises both internal (IQA) and external (EQA) processes based on proprietary guidelines to evaluate training programmes. Beyond identifying strengths and weaknesses, this framework emphasises continuous improvement through a formalised action plan, making the institution responsible for maintaining quality and meeting standards.

The framework is structured around key domains with validated criteria. For each, motivated responses are provided based on evidence, combining factual data with analysis and planned or implemented improvements. Core criteria cover achievement of learning outcomes, programme feasibility, student mobility, graduate employability, and measures to prevent unequal treatment.

Aligned with this system, the programme improvement council brings together stakeholders—teaching staff, laboratories, socio-economic partners, and students—to review the programme, identify strengths and weaknesses, and develop action plans following the Deming cycle (Plan-Do-Check-Act).

Additionally, regular meetings within the Department of Science and Energy support timely problem-solving and coordination with other programmes, ensuring the effective delivery of the CMI curriculum.

As has been emphasised throughout this report, the programme significantly benefits from its small cohort sizes and the strong sense of community shared among all stakeholders. This close-knit environment fosters open communication and collaboration between students, teaching staff, alumni, and industrial partners. Students are encouraged and motivated to provide regular, constructive feedback, which makes it much easier to identify specific areas for improvement and to implement changes that genuinely enhance the learning experience. Furthermore, alumni maintain ongoing, positive relationships with the university, which ensures that tracer studies and graduate follow-up surveys are particularly robust and informative. Industrial partners, for their part, actively participate in programme reviews and consistently offer valuable internship opportunities, thereby strengthening the link between academic training and real-world professional practice. The programme's success in these areas is evident, and it is clear that this collaborative and informal approach works well in practice.

Nonetheless, while these informal arrangements have clearly worked well to date, the assessors suggest that introducing a degree of formalisation could bring additional benefits. Formalising processes such as feedback collection, alumni tracking, and industry collaboration might help ensure these important activities continue smoothly and consistently over time, especially as the programme grows or staff change. It would also create clearer documentation, enhancing transparency and making it easier to monitor progress and evaluate the effectiveness of different initiatives. However, it is acknowledged that formalisation is not strictly necessary, given the current success of the programme's informal approach.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 5:

[...]

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution

The institution does not provide a statement on the procedure.

F Summary: Peer recommendations (03.06.2025)

The experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
CMI Hydrogen Energy and Energy Efficiency	With requirements for one year	30.09.2030	EUR ACE	30.09.2030

Requirements

For all degree programmes:

A 1. (ASIIN 1.1) Publish the current learning outcomes for all interested parties to see.

A 2. (ASIIN 1.1 / 4.2) The diploma supplement needs to be adjusted to include the learning outcomes and the specializations chosen by the individual students.

A 3. (ASIIN 4.1) Publish the current module handbooks for all interested parties to see.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to harmonize the names of the specializations between Bachelor and Master.

E 2. (ASIIN 1.3) It is recommended to enhance communication about and administration of the processes of student mobility to the students.

E 3. (ASIIN 3.1) It is recommended to increase the amount of lab technicians.

E 4. (ASIIN 5) It is recommended formalize the feedback loop for the CMI programme review with industrial partners and alumni.

G Comment of the Technical Committees

Technical Committee 01 – Mechanical Engineering/Process Engineering (05.06.2025)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and decides to follow the experts' opinion without change.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee deems that the intended learning outcomes of the degree programme do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 01 – Mechanical Engineering/Process Engineering .

The Technical Committee 01 – Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
CMI Hydrogen Energy and Energy Efficiency	With requirements for one year	30.09.2030	EUR ACE	30.09.2030

Requirements

For all degree programmes:

A 1. (ASIIN 1.1) Publish the current learning outcomes for all interested parties to see.

A 2. (ASIIN 1.1 / 4.2) The diploma supplement needs to be adjusted to include the learning outcomes and the specializations chosen by the individual students.

A 3. (ASIIN 4.1) Publish the current module handbooks for all interested parties to see.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to harmonize the names of the specializations between Bachelor and Master.

E 2. (ASIIN 1.3) It is recommended to enhance communication about and administration of the processes of student mobility to the students.

E 3. (ASIIN 3.1) It is recommended to increase the amount of lab technicians.

E 4. (ASIIN 5) It is recommended formalize the feedback loop for the CMI programme review with industrial partners and alumni.

Technical Committee 02 – Electrical Engineering/Information Technology (05.06.2025)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and decides to follow the experts' opinion without change.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee deems that the intended learning outcomes of the degree programme do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering/Information Technology .

The Technical Committee 02 – Electrical Engineering/Information Technology recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
CMI Hydrogen Energy and Energy Efficiency	With requirements for one year	30.09.2030	EUR ACE	30.09.2030

Requirements

For all degree programmes:

A 1. (ASIIN 1.1) Publish the current learning outcomes for all interested parties to see.

A 2. (ASIIN 1.1 / 4.2) The diploma supplement needs to be adjusted to include the learning outcomes and the specializations chosen by the individual students.

A 3. (ASIIN 4.1) Publish the current module handbooks for all interested parties to see.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to harmonize the names of the specializations between Bachelor and Master.

E 2. (ASIIN 1.3) It is recommended to enhance communication about and administration of the processes of student mobility to the students.

E 3. (ASIIN 3.1) It is recommended to increase the amount of lab technicians.

E 4. (ASIIN 5) It is recommended formalize the feedback loop for the CMI programme review with industrial partners and alumni.

H Decision of the Accreditation Commission (27.06.2025)

Assessment and analysis for the award of the ASIIN seal:
The Commission discusses the accreditation procedure and agrees with the experts' assessment. The commission amends the wording of the three requirements so that they are in line with the ASIIN standard formulations.

Assessment and analysis for the award of the EUR ACE Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the TC 01 and TC 02.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Accredited by German Engineers	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation*
CMI Hydrogen Energy and Energy Efficiency	With requirements for one year	With requirements for one year	30.09.2030	EUR ACE	Subject to the approval of the ENAEE Administrative Council

Requirements

For all degree programmes:

A 1. (ASIIN 1.1) Make the current learning outcomes available to all stakeholders.

A 2. (ASIIN 1.1 / 4.2) Include the learning outcomes and the specializations chosen by the individual students into the Diploma Supplement.

A 3. (ASIIN 4.1) Make the current module handbooks available to all stakeholders.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to harmonize the names of the specializations between Bachelor and Master.

E 2. (ASIIN 1.3) It is recommended to enhance communication about and administration of the processes of student mobility to the students.

E 3. (ASIIN 3.1) It is recommended to increase the amount of lab technicians.

E 4. (ASIIN 5) It is recommended formalize the feedback loop for the CMI programme review with industrial partners and alumni.

Appendix: Programme Learning Outcomes and Curricula

According to the self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the CMI programme Engineering Hydrogen Energy, Energy Efficiency:

SLO1 Acquire conceptual knowledge of Energy in general and Hydrogen Energy and energy efficiency in particular.

SLO2 Analyse complex engineering Hydrogen based Energy Systems and formulate working hypothesis according to the field of application, methods, and computational models, as well as experimental Approaches to validate them.

SLO3 Knowledge-based Design, application and experimental methods for hydrogen-based energy systems for energy efficiency.

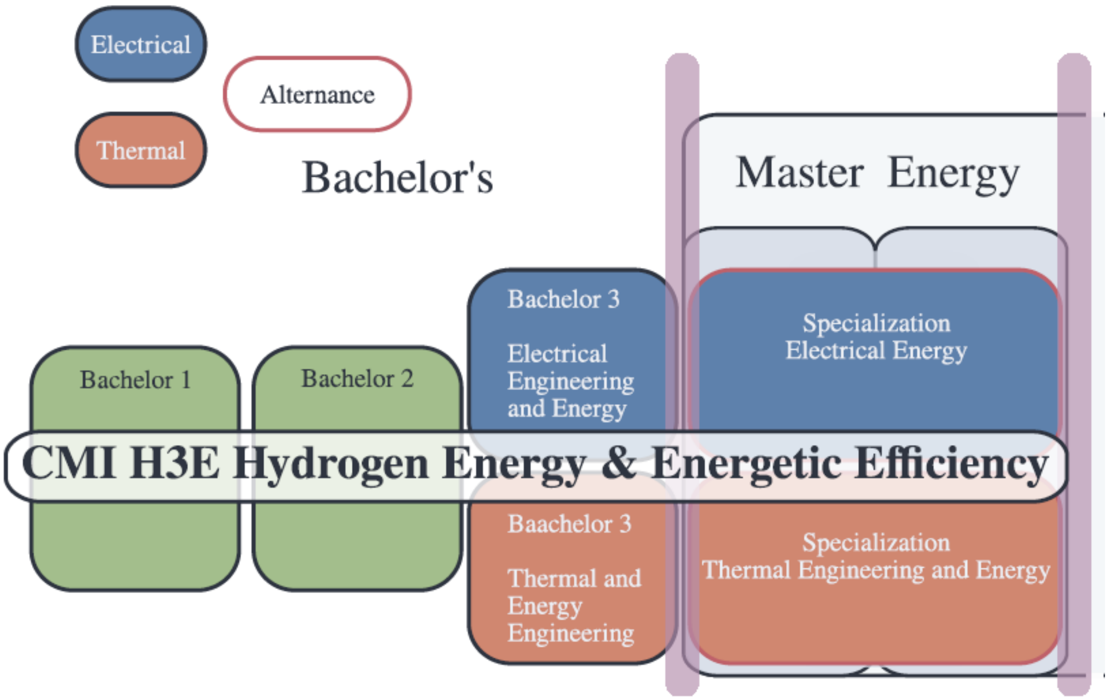
SLO4 Research, investigation and critical analysis of complex hydrogen-based energy systems.

SLO5 Conduct methods to analyse hydrogen-based systems, apply new designs and architectures in simulation and experimental methods to design and validate complex hydrogen system.

SLO6 Being Able to analyse potentialities of the hydrogen & Energy efficiency solutions, their benefits for the society, having adapted strategies for decision-making.

SLO7 Being able to use the learning skills acquired to adapt to new findings and situations by undertaking autonomous learning, investigations and studies.

The following **curriculum** is presented:


Electrical
Thermal
Alternance
Bachelor's
Master Energy
Bachelor 1
Bachelor 2
Bachelor 3
Electrical Engineering and Energy
Specialization Electrical Energy
CMI H3E Hydrogen Energy & Energetic Efficiency
Baachelor 3
Thermal and Energy Engineering
Specialization Thermal Engineering and Energy