Department of Mechanical, Energy, Management and Transport Engineering (DIME)
Master's degree in Energy Engineering

Class LM-30
Degree Regulation

General Part

Art. 1 Premise and area of competence

This Regulation, in accordance with the Statute and the University Degree Regulation (general part and special part), discipline the organisational aspects of the teaching activity of the Master's degree course in Energy Engineering, as well as any other subject devolved to it by other legislative and regulatory sources.
The Degree Regulation of the Master's degree course in Energy Engineering is resolved, pursuant to article 18, paragraphs 3 and 4 of the University Degree Regulation, general part, by the Degree Programme Board (DPB) of Energy Engineering to the majority of the members and submitted for the approval of the Board of the DIME Department, after consultation with the Polytechnic School, with the prior favourable opinion of the Joint Committee of the School.
The resolutions of the DPB can also be taken in telematic mode according to the above-mentioned regulations and, in particular, of Article 14 "meetings with telematic mode" of the current General Regulation of the University (in force since 19/12/2018).

Art. 2 Admission requirements and procedures for verifying individual preparation

Admission to the Master's degree course in Energy Engineering is subject to the possession of specific curriculum requirements and adequate personal preparation.
In order to be admitted to the Master's Degree in Energy Engineering, all following requirements, without exception, are required:

- possession of a degree, Master's degree, referred to Ministerial Decree 509/1999 or Ministerial Decree 270/2004, or a five-year degree (prior to Ministerial Decree 509/1999), obtained at an Italian University or equivalent qualifications;

- possession of at least 36 ECTS, or equivalent knowledge, acquired in any university course (bachelor's degree, master's degree, five-year degree, first and second level university master's degrees) in the disciplinary-scientific sectors (SSD) indicated for the basic training activities of class degrees L-9 Industrial Engineering;

- possession of at least 45 ECTS, or equivalent knowledge, acquired in any university course (bachelor's degree, master's degree, five-year master's degree, first and second level university master's degree) in the disciplinary-scientific sectors indicated for the training activities characterising engineering class degrees L-9 Industrial Engineering;

- adequate knowledge of the English language equal to B2 level.

In case of possession of degrees different from those indicated above and in case of foreign students the DPB will verify the presence of curricular requirements or equivalent knowledge on the basis of the exams taken by the student during the degree course of origin, as well as the presence of any extracurricular exams, internship activities and work experience acquired.

The curricular requirements must be met before individual preparation can be checked. In order to be admitted to the Master's degree course, students in possession of the curriculum requirements must successfully undergo a test to verify their personal preparation, except in the cases provided for in the last paragraph. The test will be carried out in the form of a written test (or a public interview) and will be aimed at ascertaining the general preparation of the student with particular reference to the knowledge of fundamental notions and of applicative and professional aspects related to engineering issues, including:

- Energy Systems and Machines
- Applied Thermodynamics and Heat Transfer
- Electric Systems
- Chemical Processes

The test will be held in front of a Committee appointed by the DPB and composed of professors belonging to the DPB.

The composition of the Examination Committee, the methods of the test, the place and date of the test, the subjects to be examined and the evaluation criteria of the candidates are indicated in the Notice of Admission to the Polytechnic School's Master's degree courses and on the website of the Master's degree course.

For the purposes of student assessment, the Committee will also take into account the curriculum obtained in the three-year degree course. The result of the test involves a vote in sixtieths. The written test includes 30 closed questions, which are awarded 2 points if the answer is correct, -1 points if the answer is incorrect and 0 points if there is no answer. The admission test is considered passed by a vote equal to or greater than thirty-sixtieths (36/60). The adequacy of personal preparation is automatically verified for those who have obtained a Bachelor's degree, Italian or foreign, or a qualification judged equivalent according to what has been indicated about the assessment of curricular requirements, with a final grade of at least 9/10 of the maximum grade provided for by their degree or who have obtained a final grade corresponding at least to the "A" classification of the ECTS system.

Adequate knowledge of the English language is verified by appropriate certificates in the student's possession or, in the absence thereof, by verification by the University Language Centre (CLAT Unige). Possession of an English language degree satisfies the requirement of linguistic knowledge.

Art. 3 Training activities

The list of the teaching units and other possible training activities, in the cohort 2020-2021, is given in the appropriate annex (Annex 1) which constitutes an integral part of this regulation. A responsible professor is identified for each teaching unit. A professor is responsible for teaching whoever is in charge of teaching according to the law, i.e. the one to whom the relative Department Board has attributed the responsibility itself when assigning teaching tasks to professors.

The language used to provide training activities (lessons, exercises, workshops) shall be Italian or another EU language, where expressly decided by the DPB.

Annex 1 to this regulation specifies the language in which each training activity is carried out.

Art. 4 Enrolment in individual training activities

In accordance with Article 6 of the University Regulations for students, in order enrol in individual training activities you must have a qualification which allows access to the university.

Considering the characteristics of the theoretical-practical didactic organization, applications for enrolment in individual training activities related to the DPB can be accepted only after evaluation of the DPB necessary for the proper conduct of the courses themselves.

For enrolment in individual training activities, students must submit, before the start of the teaching activities, a reasoned application to the Student Secretariat, which will forward it to the DPB, which will decide on the matter.

Art. 5 Curricula

The Master's degree course in Energy Engineering is not structured in curricula.

Art. 6 Total time commitment

The definition of the hourly fraction dedicated to lessons or equivalent teaching activities is established, for each teaching unit, by the DPB and specified in the special part of the regulation. In any case the following interval of variability of the between classroom hours/ECTS is assumed: 8 ÷ 10 hours of lesson or assisted teaching activity.

The definition of the assumed total time commitment, reserved for personal study or other training activities of an individual type, is laid down, for each teaching unit, in the annex (Annex 1) to this regulation.

The director of the DIME Department and the coordinator of the DPB shall be responsible for verifying compliance with the above requirements, including for the publication of course programmes.

Art. 7 Study plans and prerequisites

Students can enrol full-time or part-time; for the two types of student there are different rights and duties.

The student chooses the type of registration simultaneously with the presentation of the study plan. The full-time student carries out his training activity considering the study plan prepared by the degree course, which is distinguished by years of the course programme and published in the Degree Programme Table of the degree course. The study plan formulated by the student must contain an indication of the training activities, with the relative credits that he intends to achieve, provided by the official study plan for this teaching period, up to a maximum of 65 credits provided in each year.

The part-time student is required to submit an individual study plan specifying the number of credits he intends to enter.

In the absence of the completion of the study plan by the due date, a standard plan will be uploaded ex officio, except in cases where it is planned to complete an individual study plan (e.g. change of course of study, previous part-time individual study plan).

The enrolment of full-time and part-time students is regulated by the University Regulations for students considering the operational provisions resolved by the Central government bodies and indicated in the Student Guide (published annually on the University's website). The educational path of the student was organized according to criteria of propaedeuticity, indicated in the Teaching Programmed Offer. The method and deadline for the presentation of the study plan are established annually by the Polytechnic School and reported in the Degree Programme Table.

The Course of Study may, by express and reasoned resolution, authorise students who have demonstrated particularly high academic performance in the previous academic year to include in their study plan more than 65 credits, but in any case, not more than 75.

"Particularly high performance" means that the student has passed all the exams of his/her study plan by the month of September.

The study plan, which has a shorter duration than the normal one, is approved by the Degree Programme Board.

The method and deadline for the presentation of the study plan are established annually by the Polytechnic School and reported in the Degree Programme Table - Engineering Area.

Students who have followed all the lessons of their educational path, in case of debt equal to or less than 30 credits, may add "non-curricular" lessons up to a maximum of 12 ECTS to their study plan. These teachings courses are not taken into consideration for the purposes of obtaining the degree, but may be evaluated for the achievement of a subsequent qualification.

Art. 8 Attending the Classes and Teaching activity Methods

The courses take the form of: (a) lectures, including distance learning by telematic means; (b) practical exercises; (c) laboratory exercises (d) thematic seminars.

The articulated profile and the demanding nature of the lessons taught in the Course of Study make the attendance to the training activities strongly recommended for an adequate understanding of the topics and therefore for a good success in the exams.

The schedule of classes is divided into semesters. As a rule, the semester is divided into at least 12 weeks of lesson plus at least 4 weeks overall for verification tests and profit exams.

The period for profit exams ends with the beginning of the lessons of the following semester.

The lesson schedule for the entire academic year is published on the Course of Study's website before the start of the lessons of the academic year. The schedule of classes guarantees the possibility of attendance based on the years of the course programme provided for by the current Degree Programme Table. For practical reasons, the compatibility of the timetable for all formally possible optional teaching choices is not guaranteed. Students must then formulate their study plan taking into account the time of the lessons.

Art. 9 Examinations and other profit exams

Profit exams can be carried out in written, oral, or written and oral, according to the methods indicated in the sheets of each teaching unit published on the website of the Master's degree course.

On request, specific learning verification arrangements may be provided which take into account the needs of disabled students and students with specific learning disorders (D. S. A.), in accordance with art. 29 paragraph 4 of the University Degree Regulation.

In the case of teaching units structured in modules with several professors, they participate collegially in the overall evaluation of the student's profit which cannot, however, be split into separate evaluations on the individual modules.

The calendar of profit exams is established by September 30th for the following academic year and is published on the website of the Degree Course. The calendar of any intermediate verification tests is established by the DPB and communicated to the students at the beginning of each teaching cycle.

Examinations are held in periods of interruption of classes. Examinations may be planned during the period of the classes only for students who, in the current academic year, have not included training activities in their study plan.

All profit examinations of training activities must be passed by the student at least twenty days before the expected date for taking the graduation exam.

The result of the examination, with the vote obtained, is verbalized in accordance with art. 29 of the University Degree Regulation.

Art. 10 Recognition of credits

The Degree Course decides on the approval of applications for change or transfer from another degree course of the university or other universities in accordance with the rules provided for in the University Degree Regulation, art. 21. It also decides the recognition, as training credits, for a maximum number of 12 ECTS, of professional knowledge and skills certified in accordance with the current legislation.

The evaluation of applications for change will take into account the didactic specificities and the actuality of the educational content of the individual exams taken, reserving to establish from time to time any forms of verification and supplementary exams.
Within the framework of the national and regional legislation on alternance education/work, it is possible for the course of study to provide, for selected students, learning paths that also take into account work experience carried out at companies under contract.

Art. 11 Mobility, studies abroad, international exchanges

The DPB strongly encourages internationalisation activities, in particular student participation in mobility and international exchange programmes. For this purpose, it shall ensure, in accordance with the rules in force, the recognition of the training credits obtained within these programmes and shall organise the training activities as appropriate in such a way as to make these activities easier and effective.
The DPB recognizes enrolled students, who have regularly completed a period of study abroad, the exams taken off-site and the achievement of the related credits with which the student intends to replace the exams of his own study plan.
For the purposes of the recognitions of these examinations, the student at the time of the compilation of the plan of training activities, he intends to follow abroad, must produce suitable documentation proving the equivalence of content between the teaching unit abroad and the teaching unit that intends to replace taught in the Master's degree course in Energy Engineering. Equivalence shall be evaluated by the DPB.
The conversion of marks will take place according to criteria approved by the DPB, in accordance with the European ECTS system. The DPB also recognises, within the credits attributed to the final examination (Master Thesis), a portion relating to the preparation of the thesis and related research and/or internship activities carried out abroad in one of the international university programmes (e.g. Erasmus Traineeship), according to the criteria adopted by the DPB in its resolutions on the proposal of the Polytechnic School.

Art. 12 Procedures for the final examination and knowledge of the foreign language

The final examination consists in the presentation and discussion of a written thesis before a special Committee, aimed at ascertaining the candidate's technical-scientific and professional preparation.
For the purposes of obtaining a Master's Degree, the final examination consists of the writing of a thesis, elaborated by the student in an original way under the guidance of one or more supervisors, on a subject defined as relevant to a discipline for which he or she has passed the exam.
In any case, the supervisors must include at least one lecturer from the Polytechnic School and/or the reference or associate Department.
The thesis will be carried out in English; in case of use of another EU language, the authorization of the DPB is required. In these cases, the thesis must be accompanied by the title and an extensive summary in Italian.
The thesis, carried out in university laboratories, companies and national and international research institutes, must reveal the student's ability to deal with research and/or application issues. The thesis must consist of a project and/or the development of an application that proposes innovative solutions with respect to the state of the art and demonstrates the student's analytical and design skills.
The thesis must also reveal:

- ability to deal with complex problems with a multidisciplinary approach
- correct use of sources and bibliography;
- systematic and argumentative skills;
- clarity in the exposition;

- design and experimental skills;
- critical skills.

The Committee for the final examination is composed of at least five members including the Committee president and is appointed by the Director of the DIME Department.
The procedure for the final examination consists of the oral presentation of the degree thesis by the student to the Final Examination Committee, followed by a discussion of any questions raised by the members of the Committee.
The evaluation of the final examination by the Committee takes place, in the event of passing the final exam, by assigning an increase, varying from 0 to 6 points, of which 4 points as evaluation of the final examination and 2 points related to the peculiarities of the thesis work (methodological originality and relevance of the results) and/or as evaluation of the student's career (marks with *laude*, periods of study abroad with recognition of credits and periods of study abroad for the thesis).
The recommendation for publication for the master thesis work can be requested by the supervisor to the members of the Degree Committee by letter, sent at least 15 days before the graduation session, explaining the reasons for the request. Requests are eligible for which the thesis work, thanks to the candidate's contribution, may form the basis for scientific articles at conferences or in international journals. The request must be accompanied by a thesis summary of about 10 pages, structured as a scientific article. The recommendation for publication is attributed by unanimous vote of the Committee to the degree session.

Art. 13 Guidance services and tutoring

The Polytechnic School, in agreement with the DIME Department, organizes and manages a tutoring service for the welcome and support of students, in order to prevent dispersion and delay in studies and to promote a profitable active participation in university life in all its forms.
The DPB identifies within it a number of tutors in proportion to the number of students enrolled. The names of the tutors can be found on the website of the Master's degree course.

Art. 14 Verification of obsolescence of credits

University training credits (ECTS) acquired within the framework of the degree course can be subject to obsolescence verification after 6 years. If the DPB recognizes the obsolescence of even a single part of the relative educational content, the DPB itself establishes the supplementary tests that must be taken by the student, defining the topics, the methods of verification, the composition of the Examination Committee.
Once the required tests have been passed, the DPB validates the credits acquired with a resolution. If the related training activity provides for a vote, it may be varied from the one previously obtained, on a proposal from the Examination Committee which carried out the verification.

Art. 15 Degree Programme Table

The DIME Department, after consulting the Polytechnic School, approves and publishes annually the Degree Programme Table. In the Degree Programme Table are indicated the main provisions of the didactic system and the didactic regulation of the Master's degree course, to which additional information may be added.
The Degree Programme Table of the Master's degree course in Energy Engineering contains the list of the teaching units activated for the academic year in question. The individual teaching sheets are published on the website of the degree course.

Annex 1 to the Degree Regulation of the Master's degree course in Energy Engineering
List of training activities and related training objectives

PLANNED TEACHING ACTIVITY A.Y. 2020/2021
DEGREE REGULATION SPECIAL PART COHORT 2020/2021
10170 ENERGY ENGINEERING LM-30 SV

Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal study
-	1	66382	HEAT TRANSFER	HEAT TRANSFER	6	ING-IND/10	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course introduces the fundamentals of heat-transport controlled phenomena in its fundamental mechanisms (conduction, convection and thermal radiation) and shows some examples of practical application. The student will demonstrate a deep knowledge of the different heat transfer mechanisms and to be able to apply the fundamental laws to simple engineering problems. The goal of this course is to provide to the student the basis for the thermal analysis of energy transformation and production processes.	48	102
-	1	86630	MATHEMATICAL MODELING FOR ENERGY SYSTEMS	MATHEMATICAL MODELING FOR ENERGY SYSTEMS	6	MAT/07	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English		The aim of the course is to provide students with an overview of the basic mathematical methods used for the solution and the qualitative study of certain types of ordinary and partial differential equations of interest in engineering. A substantial part of the course is devoted to pc labs with Matlab in which the topics treated at the blackboard are exemplified. At the end of the course, the student acquires the ability to study the behavior of complex systems through the formulation of a simplified mathematical model capable of describing and predict the salient features of the phenomenon.	48	102
-	1	86633	CHEMICAL PLANTS AND PROCESSES FOR ENERGY	CHEMICAL PLANTS AND PROCESSES FOR ENERGY	6		RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English			0	0
-	1	86633	CHEMICAL PLANTS AND PROCESSES FOR ENERGY	CHEMICAL PLANTS AND PROCESSES FOR ENERGY	6		CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0
-	1	72562	CHEMICAL AND BIOCHEMICAL PROCESSES AND PLANTS FOR ENERGY	CHEMICAL AND BIOCHEMICAL PROCESSES AND PLANTS FOR ENERGY	6	ING-IND/25	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course describes the major alternative energy conversion processes. The course will be focused on chemical and biochemical processes to produce sustainable and clean energy for example biodiesel from microalgae, bioethanol from cellulosic and lignocellulosic biomasses and biogas from anaerobic digestion.	48	102
-	1	86631	CHEMICAL PROCESSES AND TECHNOLOGIES	CHEMICAL PROCESSES AND TECHNOLOGIES	6	ING-IND/27	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English		The course aims to provide an in-depth knowledge of the main processes of industrial chemistry related to energy production, a critical analysis of the motivations of the solutions used in the production of the main products and the criteria for a correct approach to the design of a chemical process in terms productivity, safety and protection of environment.	54	96
-	1	86634	ELECTRIC POWER SYSTEMS	ELECTRIC POWER SYSTEMS	12	ING-IND/33	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0

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Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal study
-	1	65887	POWER SYSTEMS MODELLING AND CONTROL	POWER SYSTEMS MODELLING AND CONTROL	6	ING-IND/33	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course is designed to provide the theoretical and methodological skills necessary for the understanding of the most important problems of modern electrical power systems, with particular reference to the integration of renewable energy sources (RES) and the impact that the change in the characteristics of the generating units determines in the electrical network management. The course, with strong interactive features, is proposed to support theoretical lectures with a large "experiential" part in which, through the use of dedicated software, the student can apply personally what learnt during the theoretical explanations.	54	96
-	1	86638	POWER SYSTEMS MANAGEMENT	POWER SYSTEMS MANAGEMENT	6	ING-IND/33	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course is designed to provide theoretical and methodological skills for the economic analyses related to the development of projects in the sustainable energy sector. In this context, it encompasses the fundamentals of energy markets, the procedures to calculate high efficiency cogeneration and the levelized cost of electricity. A special focus is devoted to new power production and distribution infrastructures such as smart grids and smart microgrids, with specific insight concerning with energy management platforms.	48	102
-	1	86640	INDUSTRIAL FLUID-DYNAMICS AND COMBUSTION	INDUSTRIAL FLUID-DYNAMICS AND COMBUSTION	12	ING-IND/08	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0
-	1	80054	COMBUSTION PROCESS AND EMISSIONS	COMBUSTION PROCESS AND EMISSIONS	6	ING-IND/08	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		Acquisition of the theoretical, technical and methodological skills necessary for the understanding and proper interpretation of most industrially and energetically relevant combustion phenomena. Acquisition of theoretical tools useful to the comprehension of the physical phenomena to which the combustion processes are subjected to, as well as of the implications connected with their industrial exploitation. Acquisition of fundmentale skills related to environmental issues, linked to the combustive processes. Basic competences on the main combustion diagnostic techniques	54	96

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Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal studv
-	1	86641	INDUSTRIAL FLUID-DYNAMICS	INDUSTRIAL FLUID-DYNAMICS	6	ING-IND/08	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course has two objectives, integrated and complementary to each other: first, to provide the conceptual, analytical and numerical bases of compressible flows prediction, in presence of turbulence, heat transfer and, if necessary, also chemical reactions, typically found in energy-related industrial processes, second, to provide an overview, and, in some cases, a direct operational experience ('training') on the application of CFD software tools (Computational Fluid Dynamics, also in the 'Reactive' version, CRFD) now so widespread and applied in industry. Since the main target of the course is to convey operational skills to the students, the emphasis will be more centred on the correct methodological approach to perform a sound CFD analysis, even complex, as well as on a proper 'engineering' interpretation of results, in terms of their physical consistency, trends' capturing and validation capability, rather than to provide students with competences related to turbulent Navier-Stokes equations' numerical programming. On the other hand, these equations, at least at a basic level, must be already known in their properties and application potential.	54	96
-	1	86642	POWER AND INDUSTRIAL PLANTS FOR ENERGY	POWER AND INDUSTRIAL PLANTS FOR ENERGY	6		RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English			0	0
-	1	86642	POWER AND INDUSTRIAL PLANTS FOR ENERGY	POWER AND INDUSTRIAL PLANTS FOR ENERGY	6		CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0
-	1	80053	POWER PLANTS FOR ENERGY CONVERSION	POWER PLANTS FOR ENERGY CONVERSION	6	ING-IND/09	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The aim of the course is to provide students with a detailed knowledge of the operating principles and system lay-out of power plants for energy conversion, such as gas turbine systems, steam power plant and combined cycles. Moreover, the course will give the basis for the plant performances calculation, system behaviour understanding and plant management knowledge, with particular regard to the current national and international energy scenario.	54	96
-	1	86644	INDUSTRIAL PLANTS FOR ENERGY	INDUSTRIAL PLANTS FOR ENERGY	6	ING-IND/17	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English		Provide students with operational tools for the design and operation of service systems of industrial processes in accordance with the Community rules in force. Particular emphasis is placed on safety concepts for evolving systems group 1 fluids (dangerous fluids) and group 2 (fluids under pressure) and related risk analysis.	54	96

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Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal study
-	2	80048	REMOTE SENSING	REMOTE SENSING	6	ING-INF/03	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English		Introducing the key concepts associated with Earth observation through remote sensing images for renewable energy applications. Providing the students with basic knowledge about remote sensing image acquisition and about mapping, through remote sensing image analysis, bio/geophysical parameters associated with renewable energy sources, including vegetation biomass, wind velocity field over sea water, solar irradiance, and air surface temperature.	48	102
-	2	80081	ENERGY LABORATORY	ENERGY LABORATORY	6	ING-IND/08	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		Acquisition of the theoretical, technical, methodological and practical skills necessary for the experimental investigation of combustive processes. Acquisition of the theoretical basis of the modern measurements and diagnostic techniques applicable to the combustion field as well as of operative skills in utilizing an experimental infrastructure and the measurement techniques theoretically introduced, taking advantage of the equipment present at the Savona Campus. The course foresees also the setting-up of a simple combustor project and its characterization by means of the most proper experimental techniques.	54	96
-	2	86653	RENEVABLE ENERGY IN BUILDINGS	RENEVABLE ENERGY IN BUILDINGS	12	ING-IND/10	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0
-	2	80043	SOLAR AND GEOTHERMAL ENERGY	SOLAR AND GEOTHERMAL ENERGY	6	ING-IND/10	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The aim of the course is provide the students the engineering knowledge on renewable energies as a whole and to the technologies and engineering methods to exploit the solar (thermal, photovoltaics) and low enthalpy geothermal resources in the high efficiency building contest. The goals of this course are to provide the students the capabilities related to modelling and design criteria definition, energy production estimation analysis, national and international standard knowledge and application, basic economic and financial investment analysis.	54	96
-	2	86655	ENERGY AND BUILDINGS	ENERGY AND BUILDINGS	6	ING-IND/10	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The course provides the basics of energy analysis of buildings and associated thermal plants, illustrates the actual European and national regulations and approaches the dynamic simulation of buildings with a software open-source.	48	102
-	2	86659	MACHINES AND SYSTEMS FOR RENEWABLE ENERGY	MACHINES AND SYSTEMS FOR RENEWABLE ENERGY	12		CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English			0	0

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Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal study
-	2	86660	FUEL CELLS AND DISTRIBUTED GENERATION SYSTEMS	FUEL CELLS AND DISTRIBUTED GENERATION SYSTEMS	6	ING-IND/09	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		The purpose of this course is to provide the students with the fundamental know-how related to fuel cells and to the concept of distributed generation systems. The attention is mainly focused on thermodynamic theory and component performance. Fuel cells are presented putting emphasis on different technology types, hybrid system plant layouts, technological and environmental aspects. This course also proposes to provide students with basic knowledge and operative elements to design different small size systems (internal combustion engines, microturbines, stirling engines, fuel cells) for applications in distributed generation grids. For this part of the course, special attention is devoted to combined heat and power generation providing students with laboratory experiences.	54	96
-	2	86661	HYDRO, WIND AND MICRO-GAS TURBINES	HYDRO, WIND AND MICRO-GAS TURBINES	6	ING-IND/08	CORE LEARNING ACTIVITY	Energy and Nuclear Engineering	English		Provide general knowledge on energy conversion systems from renewable sources, with particular reference to the technologies and methodologies related to the conversion of energy from wind power, hydraulic and engine plants based on the technology of gas turbines. Provide the operative tools for the dimensioning of plants and machines for energy conversion from renewable energy sources. Hydraulic and Wind Energy and distributed Cogeneration from fossil fuel or biofuel by means of micro gas turbines. Provide tools for calculating energy producibility from wind farms, hydraulic and micro gas turbine. Provide knowledge for economic and financial analysis simplified to compare different energy conversion systems.	54	96
-	2	86662	MODELS AND METHODS FOR ENERGY ENGINEERING	MODELS AND METHODS FOR ENERGY ENGINEERING	6	ING-INF/04	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or Supplementary Learning Activity	English		To provide the essential methodological tools for the statement and the solution of management and control problems relevant to energy and environmental systems. To provide an introduction to widespread and flexible software tools (such as, for instance, LINGO and MATLAB) for the solution of optimization and control problems, and for the simulation and performance analysis of the controlled dynamic systems.	54	96
-	2	86663	MASTER THESIS	MASTER THESIS	11		FINAL EXAMINATION	Final Examination	English		Master Thesis is addressed at developing students' skills in analyzing, modelling, solving and presenting the results related to energy engineering complex problems. Master Thesis consists in the realization of a detailed Report on given engineering topics thus enhancing the students' abilities in preparing professional reports and projects for their next professional career.	0	275
-	2	86664	TRAINING AND ORIENTATION	TRAINING AND ORIENTATION	1		OTHER ACTIVITY	Training and Orientation Traineeships	English		Training and Orientation is addressed at developing students' further skills in design, specific software knowledge and measurement techniques for their next professional career.	0	25

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10170 ENERGY ENGINEERING LM-30 SV

Curriculum	Year	Code	Teaching unit IT	Teaching unit EN	ECTS	SSD	Type	Area	Language	Prerequisites	Training objectives	Hours for assisted teaching activity	Hours for personal study
-	2	86665	ADVANCED PROPULSION SYSTEMS FOR LOW ENVIRONMENTAL IMPACT	ADVANCED PROPULSION SYSTEMS FOR LOW ENVIRONMENTAL IMPACT	6	ING-IND/08	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English		The main objectives of the course are: to provide an adequate and critical knowledge on environmental friendly propulsion systems for different applications, taking into account energy-related and economic issues. To develop skills for the analysis and comparison of advanced systems and technologies for ultra-low emissions Internal Combustion Engines (ICE), the use of alternative fuels (biofuels, NG, hydrogen), the development of hybrid propulsion systems and the application of fuel cells to road vehicles propulsion. To provide criteria for the selection of different systems and technologies referring to several application fields, allowing a first assessment of real benefits in terms of energy consumption and environmental impact for the proposed technical solutions compared to conventional systems.	54	96
-	2	86666	PROJECT MANAGEMENT FOR ENERGY PRODUCTION	PROJECT MANAGEMENT FOR ENERGY PRODUCTION	6	ING-IND/17	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English		The course aims to provide a significant background to EPC (Engineering, Procurement and Construction about the job manage) Project Managers starting from the overall definition of the methodology based on international standards (PMI/IPMA) and focusing to bidding phase with associated economic risks evaluation (contingencies). The student will learn to achieve an optimized management of the project ranging from the construction phase, to the suppliers selection and qualification up to the final Committeeing according to corporate policies. The proposed models, which use the Monte Carlo simulation, Design of Experiments and other appropriate business tools, will enable students to acquire the skills needed to deal with the difficulties arising from acting in stochastic regime.	54	96
-	2	86667	POWER SYSTEMS SIMULATION AND OPTIMIZATION	POWER SYSTEMS SIMULATION AND OPTIMIZATION	6	ING-IND/33	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English		The course is designed to provide the students the theoretical and methodological skills necessary for the development of power system simulation and optimization models. The goals of this course are to provide the students the capabilities related to modelling different power system technologies in off-design and transient operating conditions, through the use of dedicated software, and to developing optimization mathematical models to design and manage distributed generation plants, smart grids and microgrids, and electric mobility systems.	54	96
-	2	94763	NUCLEAR ENERGY	NUCLEAR ENERGY	6	ING-IND/19	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English		The class provides a comprehensive knowledge of the most up-to-date technologies related to the nuclear energy. The class helps to achieve the educational objectives of the course with regard to the energy uses of nuclear technology. Particularly the class provides the following contents: basics of nuclear energy and radioprotection; design and operation of nuclear fission power plants; front-end and back-end of nuclear fission fuel cycles; innovative systems for the minimization of the nuclear fission waste; hydrogen production by nuclear energy; fundamentals of nuclear fusion engineering	48	102