### Annex A

#### PHD PROGRAM IN ENGINEERING FOR ENERGY AND ENVIRONMENT

<table>
<thead>
<tr>
<th>Coordinator</th>
<th>Prof. Andrea Lugi Facci</th>
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<tbody>
<tr>
<td>Department</td>
<td>Department of Economics, Engineering, Society and Business Organization in collaboration with the Department of Agriculture and Forest Sciences</td>
</tr>
<tr>
<td>Program duration</td>
<td>3 years: 1st November 2023 – 31st October 2026</td>
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<td></td>
<td>Thesis Defence: within February 2027</td>
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#### Program objectives

The PhD program in Engineering for Energy and Environment aims to provide a high level of training to a select number of young graduates to make them competitive on a national and international level in private companies with high technological contents, research centers and universities. The main objective of the program (which is structured in two curricula, Energy and engineering systems and Biosystems and environment) is to provide an interdisciplinary view of engineering problems in the energy and environment scientific areas, characterized by a high technological development. The research activities will be devoted to the study of new engineering solutions, novel processing techniques and innovative research methodologies, with a focus on their technology transfer. Students will be engaged in training activities and scientific research in the program subjects, with particular reference to technologies for thermonuclear fusion, energy conversion processes, energy storage, environmental issues, innovations in the fields of mechanical engineering, also in agriculture, and of sensors, biosystems and agricultural issues, with regard to primary production and environmental aspects. The work of the PhD students will be coordinated by the members of the board already active in national and international industrial collaborations and research projects, in innovative and relevant topics, such as hydrogen technologies, renewable energy, biomass, biosystems and thermonuclear fusion.

#### No. of positions

<table>
<thead>
<tr>
<th>Total positions</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Positions with “PNRR DM 117” scholarship</td>
<td>4</td>
</tr>
<tr>
<td>B) Positions with “PNRR PA” scholarship</td>
<td>2</td>
</tr>
<tr>
<td>C) Positions with “PNRR Research” scholarship</td>
<td>2</td>
</tr>
<tr>
<td>D) Position with scholarships funded by external public bodies/Departments</td>
<td>5</td>
</tr>
<tr>
<td>E) Positions reserved for employees of companies which perform research and development activities</td>
<td>3</td>
</tr>
<tr>
<td>F) Positions without scholarship</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Curricula

<table>
<thead>
<tr>
<th>Curriculum “Energy and engineering systems”</th>
</tr>
</thead>
<tbody>
<tr>
<td>n. 11 positions with scholarship, n. 1 without scholarship</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Curriculum “Biosystems and environment”</th>
</tr>
</thead>
<tbody>
<tr>
<td>n. 2 positions with scholarship, n. 3 industrial doctoral positions, n. 1 positions without scholarship</td>
</tr>
</tbody>
</table>

#### Positions with “PNRR DM 117” scholarship

| M4C2 – Inv. 3.3 “Innovative doctorates aimed at strengthening the demand of innovation of enterprises and promoting the employment of researchers” | 3 |
by enterprises"

Curriculum “Energy and Engineering Systems.”
no. 4 scholarship to undertake research on:

a. Topic: “Numerical simulation of a waste biomass gasification process and of the related synthesis gas treatment system to obtain a high purity H2 stream”
Financing enterprise: Reset Srls, Roma
Advisor. Prof. Andrea Luigi Facci, Prof. Marco Barbanera.

b. Topic: “Assessment of the environmental, social and economic sustainability of the Tuscia area through the use of specific indicators and methods of analysis and evaluation of alternative investments”
Advisor: Prof. Ilaria Baffo.
Financing enterprise: Fondazione CaRiVit.

c. Topic: “Thermal analysis and characterization of industrial processes, and study of solutions for thermal efficiency and optimization of processes, districts and industrial chains”
Advisor. Prof. Andrea L. Facci, Dott.ssa Miriam Benedetti,
Financing enterprise: ENEA - Energy Efficiency Unit Department

Curriculum” Biosystems and Environment.”

d. Topic: “Large-scale forest planning, institutionally defined as Territorial Address”
Advisor: Prof. Rodolfo Picchio.
Financing Enterprise: Forest Planning (PFIT)

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**Positions with “PNRR PA” scholarship**

M4C1- Inv. 4.1 “Research Doctorates for Public Administration”

Curriculum “Energy and Engineering Systems.”
no. 2 scholarship to undertake research on

a. Topic: “The project aims at the design of usable, accessible and inclusive services in the field of green and sustainable mobility of public utility”
Advisor. Prof. Jurji Filieri

b. Topic: “Promote the digital and ecological transition of public administrations, contributing to the redesign and simplification of organizational models, as well as to the processes of selection and adoption of enabling technologies and solutions, in order to ensure greater efficacy, efficiency and cost-effectiveness of public action”
Advisor: Prof. Stefano Rossi

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**Positions with “PNRR Research” scholarship**

M4C1 Inv. 4.1 “PNRR Research lines”

Curriculum “Energy and Engineering Systems”
no. 2 scholarship to undertake research on

a. Topic: “Application of the Lattice Boltzmann method to the study and simulation of thermal energy storage systems through the use of phase change materials”
Advisor. Prof. Prof. Stefano Ubertini, Prof. G. Falcucci, Prof. A.L. Facci
b. Topic: “Hydrogen as an energy storage system to boost the energy transition”  
Advisor: Prof. Andrea Luigi Facci.

Please note that the acceptance of a PNRR scholarship implies obligations additional to those of a regular scholarship: see art. 17 of this Call.

<table>
<thead>
<tr>
<th>No. 5 scholarships funded by external public bodies and by Departments</th>
</tr>
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<tbody>
<tr>
<td><strong>Curriculum “Energy and Engineering Systems.”</strong></td>
</tr>
<tr>
<td>no. 5 scholarship to undertake research on</td>
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</table>
| a. Topic: “Development and implementation of Lagrangian methods for computational fluid dynamics, with applications to free-surface and multiphase flows”  
Funding body: Institute of Marine Engineering (CNR)  
Advisor. Prof. Prof. Andrea L. Facci e Dott. Andrea Colagrossi |
| b. Topic: “Experimental study to define harmonized testing procedures for SOEC electrolyzers in static and dynamic conditions”  
Funding body: ENEA Energy Technologies and Renewable Sources Department, Casaccia Research Centre  
Advisor: Prof. Prof. Andrea L. Facci e Dott.ssa Viviana Cigolotti |
| c. Topic: “Development of a system for the mitigation of plasma disruptions in DTT, based on the crushing of cryogenic pellets”  
Funding body: Department of Economics, Engineering, Society and Business Organization Department  
Advisor. Prof. Giuseppe Calabrò |

**Curriculum “Biosystems and Environment”**

d. Topic: “Study of the hydrological response of medium and small basins to climatic anomalies and land use changes observed on a global scale”  
Funding body: Department of Economics, Engineering, Society and Business Organization / Department for Innovation in Biological, Agro-food and Forest systems  
Advisor: Prof. Flavia Tauro |

| e. Topic: “Innovative applications for monitoring in the Agrovoltaic sector”  
Funding body: Department of Agriculture and Forest Sciences / University of Tuscia  
Advisor: Prof. Andrea Colantoni e Prof. Massimo Cecchini. |

<table>
<thead>
<tr>
<th>No. 3 positions allocated to the Industrial PhD Programme</th>
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<tbody>
<tr>
<td><strong>Curriculum “Biosystems and environment.”</strong></td>
</tr>
<tr>
<td>no. 3 positions reserved for employees of the Consortium for Technological Innovation Scrl for research projects on topics related to</td>
</tr>
</tbody>
</table>
| a. Topic: “Digitization of companies, enhancement of human capital and growth of intangible assets: training and certification of skills as a lever for the growth of human capital and business value”  
Advisor: Prof. Andrea Colantoni |
| b. Topic: “Digitization and innovation of SMEs: the role of technology transfer systems, digital sustainability and innovation managers”  
Advisor: Prof. Andrea Colantoni |
c. Topic: "The digitization of SMEs: new perspectives in the light of the PNRR"
   Advisor: Prof. Andrea Colantoni

### Positions without scholarships

- 3 positions for research projects on topics related to **Curriculum “Energy and engineering systems”**
  - a. “Model Based Systems Engineering methodology applied to the design and development of an experimental Tokamak machine”
    Advisor: Prof. Giuseppe Calabrò

### Curriculum “Biosystems and environment.”

  Advisor: Prof. Massimo Cecchini

### Admission requirements

Application to the public competition is open to all, regardless of age and citizenship, who, by the date this call expires, possess one of the qualifications listed below:
- an Italian “laurea specialistica” degree, obtained according to the Ministerial Decree n. 509/1999;
- an Italian “laurea magistrale” degree, obtained according to the Ministerial Decree n. 270/2004;
- an Italian equivalent university degree obtained under the Italian regulations previously in force, the time-span of which being no less than 5 years;
- a foreign university degree equivalent to those mentioned above.

Admission is also open to university students who will finish their MS degree by October 31st, 2023. In such cases admission will be “conditional”. Failure to obtain the degree by that date will result in forfeiture of admission to the doctoral course. If the candidate is the winner, he will be admitted and enrolled "with reserve" and must submit, by 31 October 2023, via e-mail (dottorati@unitus.it), the following documentation:
- if the degree is obtained in Italy, a self-certification relating to the achievement of the degree;
- if the qualification is obtained abroad,
  - if an Italian citizen: a self-certification relating to the achievement of the degree, the model of which will be available on the web page reserved for PhDs, with a copy of a valid identity document attached;
  - if EU citizen or non-EU citizen: a certificate or equivalent document for the achievement of the qualification, in English (eg Diploma supplement).

For graduating applicants, the score reserved for the graduation evaluation will be replaced by the evaluation of the average of the exams. Self-certification (or certification in case of Non-EU students) should state the name of the awarding University, award date, grade and type of qualification (“vecchio ordinamento”, “Specialistica”/“magistrale”) and a copy of a valid identity document.

Candidates who do not meet the admission requirements at the time of submitting their application must indicate the date by which they expect to obtain the required qualification.

### Evaluation of candidates (Maximum score: 80 out of 80)

**Evaluation of academic qualification and oral examination**

Assessment of the English Language Knowledge.

Language for the examination: Italian or English

The evaluation of qualifications is preliminary to the oral exam. The score obtained by candidates after the evaluation of their qualifications will be
added to the score of the oral examination. The results will be published on the Tuscia University web site (www.unitus.it) at the section of “Didattica”->“Dottorati di Ricerca”
Together with the application form, candidates should submit a research project, within the themes of Ph.D., up to a maximum of 5 pages, which must be written in Italian or English. The research project will be discussed during the oral exam.

### Evaluation of academic qualification (Maximum score: 20 out of 80)

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Master’s thesis: max</td>
<td>5</td>
</tr>
<tr>
<td>University career (exams taken with the relative grades and final grade): max</td>
<td>4</td>
</tr>
<tr>
<td>Research and/or study activities in foreign institutions: max</td>
<td>2</td>
</tr>
<tr>
<td>Professional experiences and other qualifications that each candidate considers useful: max</td>
<td>4</td>
</tr>
<tr>
<td>Research project submitted by the candidate: max</td>
<td>5</td>
</tr>
</tbody>
</table>

Before of the oral exam, the evaluation of academic qualification results will be published on the Tuscia web site www.unitus.it (section “Didattica” > “Dottorati di Ricerca”).

### Evaluation of the oral exam (Maximum score: 60 out of 80)

Oral exam: maximum score 60 out of 80 points
The minimum score for a positive oral exam will be at least 40 out of 80 points.
The foreign language subject to verification will be English.

### Topics of the oral examination

The oral test, aimed at ascertaining the candidate aptitude for scientific research, will focus on the discussion of issues related to the PhD program topics and the research project presented by the candidate. The oral exam will include a verification of the English language knowledge based on reading and translation of sections of a scientific text.

### Exam dates and location

The exams will be held between 6th – 20th of September 2023.
The date(s) of the interview will be published on the University website at the site: www.unitus.it >Didattica>Offerta post lauream> Dottorati di Ricerca by the deadline of the application call.

### Contact to information

Contacts of the course:
Prof. Andrea Luigi Facci: andrea.facci@unitus.it
Prof. Massimo Cecchini e-mail: cecchini@unitus.it
Prof. Giuseppe Calabrò e-mail: giuseppe.calabro@unitus.it