Ten steps for designing new degree programmes or improving existing ones

1. Is there a need? Determine, consulting stakeholders, whether there is really a need for the proposed course of study.

2. Define the profile and the key competences. Find out what competences are actually useful for employment, personal culture and citizenship (see inside this guide for a list).

3. Define the learning outcomes indicating the most important competences (choose around 10 key competences with reference to the cycle level indicators; see inside this guide).

4. Decide whether to ‘modularise’ (course units can be of a random number of ECTS credits, or else of a set number, e.g. 5, hence “modularised”).

5. Define the learning outcomes and the key competences in each module or course unit (the list of competences inside this guide will help).

6. See how those competences can best be formed and assessed, using a variety of approaches to learning, teaching and assessment.

7. Check that all the key generic and subject specific competences have been taken into account.

8. Describe the programme and the course units, indicating the learning outcomes in terms of competences.

9. Check for balance.

10. Implement, monitor and improve.
Subject Specific Competences for Engineering:

- S1 Ability to perform engineering and technical and economic calculations
- S2 Ability to design and construction
- S3 Capacity for spatial reasoning
- S4 Ability to mathematical modelling
- S5 Ability to solve practical engineering problems
- S6 Ability to identify hazardous and harmful factors and guarantee safety
- S7 Ability to classify and to assess the quality and types of materials, structures and constructions
- S8 Ability to identify and troubleshoot processes and technical systems
- S9 Knowledge and ability to use national and international standards in industry
- S10 Ability to professional relationships in an international context
- S11 Ability to use innovative technologies and new materials in the industry
- S12 Basic knowledge of the legal and financial documentation in the industry
- S13 Ability to predict the environmental consequences of projects and processes
- S14 Knowledge, development and implementation of automated control systems
- S15 Ability to formulate and solve scientific problems, conduct research to obtain new scientific and practical results
- S16 Ability to generalize and use scientific achievements in addressing industry challenges
- S17 Ability to teaching and transfer of professional knowledge
- S18 Ability to use information technology, software in the industry
- S19 Ability for self-improvement and self-development in profiling and teaching activities
- S20 Ability to give priority to domestic resources and their rational use
- S21 Ability to create new technical and technological processes using local resources and materials
- S22 Ability to adapt to the characteristics of the engineering design of cultural and ethnic backgrounds
- S23 Ability to use relevant knowledge infrastructure in the planning and forecasting of engineering projects
- S24 Ability to comply with a code of engineering ethics
- S25 Ability to make a trend of sustainable development, taking into account profiling activities (product development, components and engineering processes).

Most important General Competences for Engineering:

- G7 Ability to develop general knowledge
- G10 Knowledge of the professional field
- G25 Ability to apply knowledge in practice
- G14 Ability to manage information
- G23 Commitment to quality results
- G3 Ability to model, design and forecast

Most important Subject Specific Competences for Engineering:

- S11 Ability to use innovative technologies and new materials in the industry
- S5 Ability to solve practical engineering problems
- S3 Capacity for spatial reasoning
- S13 Ability to predict the environmental consequences of projects and processes
- S25 Ability to make a trend of sustainable development, taking into account profiling activities (product development, components and engineering processes)
- S1 Ability to perform engineering and technical and economic calculations
- S15 Ability to formulate and solve scientific problems, conduct research to obtain new scientific and practical results
- S8 Ability to identify and troubleshoot processes and technical systems
- S7 Ability to classify and to assess the quality and types of materials, structures and constructions

Examples of Engineering competences according to level of study

<table>
<thead>
<tr>
<th>Level</th>
<th>Knowledge</th>
<th>Skills</th>
<th>Autonomy and responsibility</th>
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<tbody>
<tr>
<td>BA</td>
<td>Possession of basic, professional and advanced knowledge; Know the principles of scientific research; Knowledge of developing technologies related to the specialization.</td>
<td>Perception and knowledge development; Modelling, design, and forecasting; Communication in the state and Russian languages, and in a foreign language; Use of ICT; Spatial thinking</td>
<td>Individually apply knowledge in practice; Manage information; Focus on quality goals; Be committed to a healthy lifestyle.</td>
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<tr>
<td>MA</td>
<td>Deep knowledge of mathematical and computer models; Know the basics of specialized scientific and advanced engineering methodology and research activities; Possess knowledge about innovative technologies and new materials in the industry.</td>
<td>Apply the methods of design and integrate knowledge from different fields; Manage the design and evaluation of results; Develop innovative engineering projects, products, materials, etc.; Have a systematic approach to engineering problems.</td>
<td>Demonstrate a deep understanding of the scientific principles of the specialization and related disciplines; Navigate the scientific and engineering environment; Take professional responsibility for the technical development and for the fulfillment of the results; Anticipate the environmental consequences of projects and processes; Take into account sustainable development profiling activities (product development, components and engineering processes).</td>
</tr>
<tr>
<td>PhD</td>
<td>Possess the latest knowledge and technology in their professional field as well as in related fields; Have advanced knowledge of methods and research methodology.</td>
<td>Analyze scientifically the most advanced engineering and technical information; Formulate and solve scientific problems, conduct research to obtain new scientific and practical results; Carry out on a qualitative level the organization and management of the process of design; Adapt and apply them in new and unpredictable situations.</td>
<td>Demonstrate creativity and innovation in the synthesis of solutions and development projects; Have a high level of professional ethics; Submit, discuss and defend one’s individual research results in an advanced international context.</td>
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