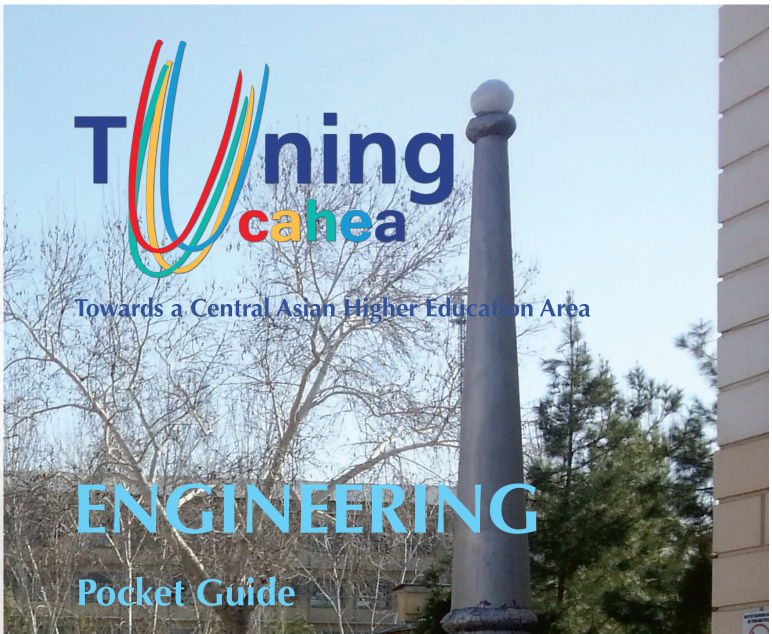
Ten steps for designing new degree programmes or improving existing ones

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 lists 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.

Co-funded by the Tempus Programme of the European Union



ENGINEERING

Pocket Guide

www.tucahea.org

The goal of the TuCAHEA Consortium is to create the premises for a Central Asian Higher Education Area: visible, respected, and compatible with higher education areas in other parts of the world. TuCAHEA uses Tuning methodology to provide tools to ensure that graduates have the necessary competences for future employment, personal culture, and citizenship.

Working together, 34 Central Asian Universities, 8 European Universities and the five Ministries responsible for Higher Education in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan have consulted more than 20,000 academics, graduates, students and employers, and have formulated Guidelines and Reference Points for 8 important Subject Areas: Business and Management, Economics, Education, Engineering, Environmental Protection, History, Language, and Law.

This 'Pocket Guide' gives a short summary of the competences required for one Subject Area.

The following are the 30 general competences chosen as most important for all Central Asian degree programmes:

1. Ability to analyze and synthesize
2. Ability to use logical and critical thinking for solving problems
3. Ability to model, design and forecast
4. Ability to carry out research applying appropriate methods
5. Ability to take initiatives and entrepreneurship
6. Ability to innovate
7. Ability to develop general knowledge
8. Ability to learn including autonomous learning
9. Ability to communicate interactively and receive feedback
10. Knowledge of the professional field
11. Ability to communicate in multicultural context
12. Ability to communicate in official state, Russian and foreign languages
13. Ability to lead people and work in a team
14. Ability to manage information
15. Ability to use information and communication technologies
16. Social responsibility
17. Ability to follow a healthy lifestyle
18. Ecological and environmental responsibility
19. Knowledge of the laws
20. Ability to prevent and resolve conflicts
21. Patriotism and preservation of own cultural values
22. Tolerance and respect for others
23. Commitment to quality results
24. Flexibility
25. Ability to apply knowledge in practice
26. Orientation toward the needs of the user
27. Ability to work autonomously
28. Ability to adapt to change
29. Ability to make decisions
30. Time management

Full information is available on the www.tucahea.org website

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
G4 Ability to carry out research applying appropriate methods
G17 Ability to follow a healthy lifestyle
G12 Ability to communicate in official state, Russian and foreign languages
G15 Ability to use information and communication technologies

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 the 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

	Knowledge	Skills	Autonomy and responsibility
BA	Possession of basic, professional and advanced knowledge; Know the principles of scientific research; knowledge of developing technologies related to the specialization.	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; Perform engineering and technical and economic calculations; Identify and troubleshoot technical and technological processes.	Individually apply knowledge in practice; Manage information; Focus on quality goals; Be committed to a healthy lifestyle.
MA	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.	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.	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 fulfilment of the results; Anticipate the environmental consequences of projects and processes; Take into account sustainable development profiling activities (product development and engineering processes);
PhD	Possess the latest knowledge and technology in their professional field as well as in related fields; Have advanced knowledge of methods and research methodology.	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.	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.

This leaflet is produced by the Consortium of the TuCAHEA Tempus Project 530786-TEMPUS-1-2012-1-NL-TEMPUS-SMHE, with the support of the European Commission (DG EAC). It is the sole responsibility of the Consortium; the European Commission is not responsible for it or for any use made of it