

**Required TRIZ knowledge standard for applicants to be certified
as "TRIZ user" for levels 1 – 3**

Level 1

Required knowledge:

TRIZ. Sources and components of TRIZ.

The notion of Engineering system (ES) and its functions. Super-systems and sub-systems.

Inventive situation and inventive problem, mini problem. Non-desirable effect (NE). Cause-effect chains as a means for identifying key NE.

A tree of goals and use of this tree in the analysis of inventive situation.

Ideality, ideal final result (IFR) as an operator for selecting a direction for problem solving.

Resources, types of resources. System analysis as a tool for search for resources.

Contradiction (EC, PC), problem solving as optimization and as contradiction resolution.

Techniques for eliminating EC.

Trends of engineering systems evolution.

Required level of competence:

1. Understand the essence of TRIZ and be able to render it in own words.
2. Know the fundamental notions of TRIZ (within the scope of proposed minimum) and be able to illustrate it with own examples.
3. Find subsystems and super-systems of specified object.
4. Find a key NE via construction of cause/effect chains.
5. Formulate EC.
6. Work with the Table of EC resolution.

Grounds for certification:

Verbal or written test.

Required length of training: not less than 24 hours

Level 2

Required knowledge:

Trends of engineering systems evolution.

Analysis of initial situation (in-depth exploration and analysis).

DTC operator (Dimension - Time - Cost).

IFR, a step backward from IFR. Practice of using IFR for solving inventive problems.

The notion of Su-Field. Su-Field analysis. Synthesis of engineering solutions using Su-Field analysis.

Standards. Application of standards for inventive problem solving.

Effects (physical, chemical, geometrical). Application of these effects for problem solving.

ARIZ-85 (acquaintance). Structure. Logics. Tools. Macro- and micro-levels of PC. Method of smart little men.

Comparative analysis of existing methods and TRIZ: Brainstorming, Synectics, Morphological analysis and synthesis. Main principles and area of application. Versions of methods.

Required level of competence:

1. All Level 1 requirements.
2. Illustrate the main notions of TRIZ with own examples.
3. Use the notion of IFR in problem solving

4. Be able to solve problems using Su-Field analysis.
5. Be able to solve problems using standards
6. Be able to use effects in problem solving.
7. Know the structure of ARIZ, have skills of formulating macro- and micro- PC.
8. Be able to use the method of smart little men in problem solving.
9. Application of studied TRIZ tools for solving training problems.
10. Knowledge of main principles and fields of application of other methods.

Grounds for certification:

Term paper or written test

Required length of training: not less than 40 hours

Note: When certification is directly to Level 2, the required length of training is not less than 64 hours

Level 3

Required knowledge, skills and abilities:

Application of ARIZ-85C for problem solving.

Lines of engineering systems evolution, forecasting of development.

VEA (Value Engineering Analysis). Main principles and possible fields of application. Stages of VEA. Employment of VEA for improving devices and technologies.

Research problem, method for problem inversion.

Failure anticipation analysis.

Place of TRIZ in the system of innovative methods.

Examples of using TRIZ in non-engineering spheres.

Review of modern TRIZ tools (Function analysis of Inventive situation - FAIS, integration of alternative systems developed by Gerasimov, Algorithm of inventive problem selection - AVIZ, Trees of evolution)

Required level of competence:

1. All Level 1 and 2 requirements
2. Illustrate the main notions of TRIZ with own examples.
3. Analysis of inventive situation (using one of the methodologies accepted in TRIZ).
4. Problem solving using ARIZ-85C.
5. Ability to "convert" a research problem into an inventive one.
6. Forecasting the evolution of an engineering object.
7. Failure anticipation analysis.

Grounds for certification:

Degree thesis plus a problem analysis using ARIZ-85C

Required length of training: not less than 80 hours

Note: When certification is directly to Level 3, the required length of training is not less than 144 hours