**UNIVERSITY OF TWENTE.**

# "TRIZ Fundamentals" Summer Course

## 10-Day (80 hours) Hands-on Training Course and Certification

*July 8-19, 2013*
*University of Twente, Enschede, The Netherlands*

*Principal Trainer: Valeri Souchkov, M.Sc*
*Assistant Trainers: Tom Vaneker, Ph. D, Wessel Wits, Ph.D*

## 1. SYNOPSIS

A main goal of this unique intensive 80-hour hands-on course is to learn and master skills with modern TRIZ and Systematic Innovation for Technology and Engineering in order to increase creative and innovative productivity and performance of organizations and individuals. The course focuses on learning how to use the TRIZ paradigm and its techniques for solving problems arising in products and technologies and generation of new ideas and solutions.

The course provides understanding of principles and fundamentals of systematic innovative thinking and techniques of systematic innovation and puts them in practice. The acquired skills help the course participants to resolve conflicting demands in a "win-win" way, maximize the use of resources, innovatively improve systems and processes, and invent new products and technologies. In addition to learning about philosophy, key concepts, process, techniques and tools, the participants acquire the basic practical skills of working with advanced TRIZ and Systematic Innovation techniques during the course, which help to extract root conflicts, resolve contradictions, identify and model system relationships, and apply the Trends of Technology Evolution to identify evolutionary potential of business systems and propose new innovative ideas.The course also includes xTRIZ additions to TRIZ to make problem formulation and solving processes more consistent and effective. xTRIZ is a practical framework developed by ICG T&C, which extends classical TRIZ. It has been tested at numerous real cases worldwide which have proven its effectiveness. The course contains different examples to better understand the nature of TRIZ and its thinking methodology and make it applicable to a large variety of problems, products, and technologies.

The course introduces unique material developed by the author of the course and not available yet from any other sources apart from the parties with licenses from ICG T&C. During the course, the participants work on real-life projects.

The course is official and introduced by the Twente University as a part of educational curriculum. Since 2010, this course is open to general public.

## 2. GOALS OF THE COURSE

- Understand and learn principles and fundamentals of advanced TRIZ and Systematic Innovation.
- Learn and master skills with techniques of xTRIZ and advanced TRIZ.
- Learn how to apply the techniques to real situations concerning improvement of the existing products and technologies as well as inventing new generations of products and services.
- Acquire practical skills by working on real-life projects.

## 3. TARGET AUDIENCE

- Bachelor Industrial Engineering and Mechanical Engineering students and M.Sc students in any engineering discipline of the University of Twente.
- Students of similar disciplines of European Universities.
- Engineers and R&D professionals, innovation professionals, new product and technology development professionals, technology managers, new business development managers, technology executive officers, Six Sigma specialists, technical creativity and innovation trainers and facilitators, consultants, lecturers.

Previous experience with TRIZ is not required.

## 4. VALUE OF THE COURSE

- The course participants will become capable of solving most difficult inventive problems arising within their area of competence. Such skill brings tremendous value to a problem solver due to considerably shortened time for finding solutions and guided search towards most effective solutions.
- The course participants will be able to use the course materials and acquired skills in their own practice.
- Knowledge of TRIZ positively affects short and long-term benefits that can be obtained by the problems solvers and their organizations due to the acquired ability to quickly and systematically search for new solution ideas and develop new generations of products and services.



## 5. STRUCTURE OF THE COURSE

Each training day (except the first and last days) is split to three parts:
- Selected presentations of practical assignments performed by the participants.
- Lectures on a new subject.
- Practical assignments using the material from the lectures.

## 6. COURSEWARE

The courseware includes the course slides, the course book "Guide to TRIZ and xTRIZ Techniques" with TRIZ and xTRIZ techniques as well as various reference materials, the book "TRIZ: The Right Solution at the Right Time". Additional books can be available. All courseware (except third-party books) will be also made available in electronic form for individual use by each participant during and after the course.

## 7. CERTIFICATION

Upon successful completion of the course, each participant will be awarded with the "TRIZ Practitioner (Advanced Level)" certificates issued by the University of Twente in affiliation with The TRIZ Training International Centre and signed by Valeri Souchkov, co-founder of the European TRIZ Association (ETRIA). B.Sc and M.Sc EU students successfully completing the course will also obtain 3 European Credits. In addition, every participant will be eligible to apply for a certificate of the International TRIZ Association (MATRIZ).

## 8. COURSE CONTENTS

- Modern view on innovation, innovation triggers and sources, technology evolution via innovation.
- TRIZ and its origins. Knowledge-based approach to innovation. Systematic Innovation.
- Place of TRIZ in a modern innovation process.
- TRIZ as a theory for innovation front-end and as a collection of tools and techniques to support correct problems formulation and new ideas generation in a systematic way.
- Understanding product and process evolution via innovative problem solving and new products conception.
- Psychological inertia and its role in the development of innovative thinking skills.
- Roadmap to the basic and advanced TRIZ techniques.
- Introduction to contradiction-driven technology evolution and problem formulation.
- Root Conflict Analysis (RCA+) for problem analysis by contradictions identification and mapping.
- *Practice with Root Conflict Analysis (RCA+)*
- Contradiction Matrix and 40 Inventive Principles for systematic contradiction elimination .
- *Practice with Contradiction Matrix and 40 Inventive Principles*
- TRIZ-based Function Analysis to model functional interactions within a product or a process to discover a full set of problems and challenges which can be used for innovative improvement of a selected product or technology.
- *Practice with TRIZ-based Function Analysis on the customer's problems.*
- Functional Trimming: increasing benefits/costs ratio of products and processes.
- Substance-Field Modeling to build abstract models of problems.
- Explanation of 76 Inventive Standards system: a structured collection of practical techniques on eliminating negative and improving positive effects within products and processes.
- *Practice with Substance-Field Modeling and 76 Inventive Standards.*
- Analysis of innovative potential of technical systems.
- Demonstration of TRIZ technology evolution trends and specific patterns of evolution with examples.
- *Practice with the TRIZ Trends of Evolution.*
- Value Conflict Mapping for identifying future opportunities based on market trends and demands.
- *Practice with Value-Conflict Mapping.*
- ARIZ (Algorithm of Solving Inventive Problems): logic of ARIZ, explanation of major concepts, structure, and working principles, resolving physical contradictions, fighting mental inertia.
- Detailed analysis of a problem solving process with ARIZ on the basis of specific examples.
- Ideas evaluation, selection, and landscaping techniques.
- Overview of additional tools of TRIZ and xTRIZ: Multi-Screen Analysis, Creative Imagination Development.
- TRIZ Implementation aspects.
- Questions and Answers, Discussions.

## 9. PRINCIPAL TRAINER

Valeri V. Souchkov, M.Sc, internationally acknowledged innovation and TRIZ expert, developer and trainer certified by G. Altshuller (the founder of TRIZ). He pioneered professional TRIZ activities in Western Europe and USA and has experience with delivery of TRIZ and Systematic Innovation services worldwide since 1989. He trained and assisted professionals of more than 200 customer organizations including Capgemini, DSM, DuPont, ING, LG Group, Orange, Reckitt Benckiser, Philips, Posco, Sekisui, Shell, Siemens, Thales, TNO, TNT Post, Vredestein, Unilever, Watson Marlow; as well as universities and government agencies. In total, he trained more than 4.000 professionals in TRIZ and Systematic Innovation. Valeri is also an invited lecturer of TRIZ courses at the University of Twente (Enschede, the Netherlands), and invited lecturer on TRIZ of several other universities worldwide. In 2000 he originated and co-founded the European TRIZ Association (ETRIA). He is a head of the Group on Global TRIZ Developments of the International TRIZ Association (MATRIZ). He is co-author of 2 books and author of more than 80 publications including journals and conference proceedings. He is the author of the course.

## 10. GENERAL

- Training will be conducted at the University of Twente campus, "Horst" building, in Enschede, The Netherlands.
- The course will run on business days. The weekend (Saturday-Sunday) is free.
- A training day lasts at least 8 hours including lunch and breaks. Usually the training day starts at 09:00 and finishes around 17:30, with a lunch break from 12:30 to 13:45.
- The second half of each day (except the first and the last days) will be spent by doing practical assignments in groups, therefore the groups might select their preferred location.
- During the course, the participants learn by working on their own projects. It is desired that the participants bring their own problem(s) to the course provided the information can be disclosed publicly.

## 11. LANGUAGE

The course is conducted in English.

## 12. FEES, TERMS AND CONDITIONS

- For a non-student participation, the full course fee per seat for the 80-hour (3 European Credits) course is EUR 2.642 (including Value-Added Tax, EUR 462). This fee applies only to those participants who do not have an official student status within the European Union.
- 21% Value-Added Tax (VAT) should be paid by organizations located in the Netherlands or outside the European Union, as well as EU organizations which do not have registered VAT number, and all private persons. Paid VAT can be later reclaimed in full from the Netherlands Tax Authorities by business organizations located outside the European Union.
- For a non-student participation 10% discount is available in case of early registration (before May 01, 2013).
- 50% discount is available for full-time staff members of non-profit educational or academic organizations and full-time international students.
- Payment should be done on the basis of the invoice sent to a registered participant by ICG T&C after registration. Term of payment is two weeks from the date of the invoice.

- Officially registered students of the European Universities should contact us as soon as possible for financial details.
- Price covers: full participation in the course, the course materials and handouts, as well as 3 months after-course "Questions and Answers" support, certificate.
- Accommodation and travel expenses are not included to the course fee and are arranged by each participant independently. There is a selection of B&B places and hotels close to the campus. Prices range from EUR 30 (B&B) to EUR 50-120 (hotels) per night. Please contact us for further details.
- Full payment of the course fee prior to the starting course date is obligatory.
- Payment of the course fee by non-student participants will be based on an invoice issued by ICG T&C upon registration. Payment term is two weeks since the date of the invoice.
- Note that a total number of participants as well as percentage of non-student participation is limited. Therefore we advice you to make your definite reservation as early as possible.

## 13. CANCELLATION

- If participation in the course is cancelled by a customer one months before the course starting date, ICG T&C provides 100% refund a total amount of fee(s) paid by a customer. Otherwise ICG T&C retains 20% of the paid fee.
- If the course is cancelled by ICG T&C or the University of Twente, ICG T&C guarantees full refund of a total amount of fee(s) paid by a customer within two weeks after cancellation announcement unless it is explicitly agreed otherwise with a customer.

## 14. MAINTENANCE AND SUPPORT

- The course fee includes 3 months of free "Questions and Answers" support by ICG T&C by phone, fax, or e-mail.
- During the first 6 months after the last day of the course, ICG T&C expert might be available to the customer's organization for additional training, consulting, or coaching for total up to 5 days with 20% discount of standard ICG T&C rates.

## 15. FOLLOW-UP SERVICES

For non-student participants, the follow-up services might include:

- Training of different groups and teams within a customer organization.
- After-training individual and group coaching.
- Assistance with Innovative Projects, facilitation of working sessions.
- Assistance with corporate-wide TRIZ and Systematic Innovation implementation.

## 16. NON-PARTICIPATION IN BENEFITS AND INTELLECTUAL PROPERTY OWNERSHIP RIGHTS

Often during our training courses, participants generate new ideas which can be later considered as intellectual property and protected by patents. ICG T&C and/or parties affiliated with ICG T&C will not demand participation in potential benefits which might be obtained by the customer from implementation of solutions resulted from the training courses unless agreed otherwise before or during the training courses.

## 17. FURTHER USE AND APPROPRIATE LICENSING

The course content learned and the courseware obtained during this course might be used by the customer organization and the course participants without limitation both internally as well as externally in their any work activities which are not related to training on subjects of TRIZ, xTRIZ and Systematic Innovation. However to use the course content (except which is in a public domain) and courseware for independent training activities (both internal and external), a relevant accreditation and license(s) should be requested from ICG T&C.

## 18. COPYRIGHTS

All materials presented and distributed during the training course hold copyrights of the course author(s) or their respective owners. If the need arises to copy any part of the materials outside these terms and conditions, a customer should contact ICG T&C for additional agreement. Audio or video recording of the course or its parts is only allowed according to a prior agreement with ICG T&C.

## 19. REGISTRATION

A link to registration is located at:  http://www.xtriz.com/summercourse.htm

### CONTACT AND FURTHER INFORMATION

#### For non-student participation:

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#### For EU student participation:

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The University of Twente is a fully accredited international entrepreneurial research university with 3.300 scientific and educational staff and 9.000 students of more than 70 nationalities. It is located in Enschede, The Netherlands.

ICG Training and Consulting is a training, consulting and development company registered in Enschede by Chamber of Commerce (KvK) of the Netherlands. KvK registration number: 08128729. European Union VAT ID number (BTW): NL 212643599B01

# UT: Two-Week TRIZ Fundamentals Program: Technology & Engineering.

Monday-Friday: The course starts daily at 09:00, finishes at 17:30. Second week Friday the course finishes at 16:00. Lunch break: 12:30-13:45.

| DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 |
|---|---|---|---|---|
| **GOAL:** Understand basics and key principles of TRIZ: evolution, contradictions, ideality, problem solving. | **GOAL:** Understand and learn RCA+ (Root Conflict Analysis) | **GOAL:** Understand, learn and practice Contradiction Matrix and 40 principles, Ranking and Evaluation techniques. | **GOAL:** Understand, learn and practice with Function Analysis | **GOAL:** Understand, learn and practice Substance-Field Modeling, and a System of 76 Inventive Standards |
| **CONTENT:**<br>• Inventive problems and innovative situations.<br>• Psychological inertia and barriers to strong solutions.<br>• Triggers of innovation.<br>• Systematic approach to idea generation.<br>• Introduction to the TRIZ background and key principles of Systematic Innovation.<br>• Systems evolution via contradictions resolution.<br>• Key principles of problem solving; criteria of "right" solutions.<br>• Ideal Final Result and Ideality-Value Formula. | **CONTENT:**<br>• xTRIZ Roadmap.<br>• xTRIZ Basic Problem Solving and Conflict elimination Process.<br>• General innovative principles and patterns for contradiction elimination.<br>• **Root Conflict Analysis (RCA+):** problem modeling and building contradiction maps.<br>• Rules of selection of contradictions from RCA+ models. | **CONTENT:**<br>• Use of Resources.<br>• **40 Inventive Principles**<br>• **Contradiction Matrix** for systematic access to 40 Inventive Principles.<br>• Generating ideas with 40 Inventive Principles.<br>• Idea combinations and building an **Ideas Portfolio.**<br>• Different versions and limits of Contradiction Matrix.<br>• **Ranking and landscaping** ideas | **CONTENT:**<br>• **Function Analysis:** system modeling on the basis of functional interactions.<br>• Discovering existing and potential problems and challenges from functional system models.<br>• Comparative Ranking and selecting problems to solve.<br>• **Catalogues to Scientific Effects**<br>• Functional hierarchy and Rules of **Functional Idealization (Trimming).** | **CONTENT:**<br>• **Substance-Field Modeling and Analysis**<br>• Substance-Field Resources<br>• System of **76 Inventive Standards**<br>• Evolutionary structure of the system of 76 Inventive Standards: link with Trends of Technology Evolution<br>• A tree and navigation among 76 Standards<br>• Problem Solving with Inventive Standards |
| **PRACTICE:**<br>Exercises: kick-off exercises; generating ideas with a morphological matrix; fighting mental inertia; recognition and formulation of innovative problems. | **PRACTICE:**<br>Practice with selecting a problem, building RCA+ diagram of the problem, identifying contradictions with RCA+, ranking contradictions. | **PRACTICE:**<br>Practice with customer projects: solving specific problems extracted from RCA+ with 40 Inventive Principles, and generating Idea Portfolios. | **PRACTICE:**<br>Practice with building functional models of systems, identifying problems and challenges, selecting problems to solve | **PRACTICE:**<br>Practice with application of a system of inventive standards to solve problems and generate new ideas to innovatively improve systems. |

| DAY 6 | DAY 7 | DAY 8 | DAY 9 | DAY 10 |
|---|---|---|---|---|
| **GOAL:** Understand and getting an overview of a system of TRIZ Laws, Trends and Lines of Technology Evolution | **GOAL:** Further learning of specific Trends and Lines of Technology Evolution; learning Evolutionary Potential Analysis. | **GOAL:** Learn Value-Conflict Mapping | **GOAL:** Understand and learn the first parts of ARIZ-85C (Algorithm of Solving Inventive Problems). Starting a final project. | **GOAL:** Getting an overview of a contemporary TRIZ, TRIZ software, how TRIZ is used in real projects. Working on a final project. |
| **CONTENT:**<br>• Technology Evolution models: S-curve, Bell-Curve, change of parameters of value, investment decisions.<br>• Evolution towards local ideality and adaptive variation of technologies and products.<br>• Laws of Technology Evolution.<br>• **Functional Evolution**<br>• Use of Functional Evolution for technology functional forecast<br>• **Technology Evolution Laws, Trends and Lines** | **CONTENT:**<br>• **TRIZ Trends and Lines of Evolution**<br>• Strategies of Technology Evolution<br>• Scenarios of Products and Technology Evolution<br>• Process of Evolution Forecast<br>• **Evolutionary Potential Analysis** and radar plots to explore product's evolutionary potential. | **CONTENT:**<br>• **Value-Conflict Mapping:** linking customers, market, and technology demands, identification of Contradiction Trees and system parts to evolve<br>• Assessment of Contradiction Trees and selection of best candidates for further development and improvement | **CONTENT:**<br>• Introduction to the logic and philosophy of **ARIZ (Algorithm of Solving Inventive Problems)**<br>• Use of RCA+ with ARIZ.<br>• Mini-problem, macro- and micro- physical contradictions, Ideality.<br>• Explanation of Parts 1-6 of ARIZ 85-C based on solving a real problem in the class. | **CONTENT:**<br>• Contemporary TRIZ, versions of TRIZ<br>• TRIZ Supporting Software<br>• TRIZ for creating patent portfolios, patent umbrellas, and patent circumvention<br>• Aspects of TRIZ use and implementation, integration of TRIZ with other methods (QFD, DFSS)<br>• Discussions, questions and answers. |
| **PRACTICE:**<br>Practice with S- and Bell-curves of evolution. Functional Evolution assessment of selected technology examples. | **PRACTICE:**<br>Selection of a subsystem to evolve. Application of lines of evolution to a selected system to generate new ideas. | **PRACTICE:**<br>Practice with Value-Conflict Mapping. Selection of a subsystem to evolve. Using Trends of Evolution to generate new ideas. | **PRACTICE:**<br>Practice with a final project with TRIZ and xTRIZ: from problem formulation towards a landscape of generated ideas. | **PRACTICE:**<br>Completing the final project with TRIZ and xTRIZ. |

The program might slightly vary during each course