

SYLLABUS

Credits Number: 3

Weeks Number: 16

OBJECTIVES

Module Inventive Problem Solving offers an introduction to some of the most cutting-edge inventive problem solving techniques. The module provides you with the technical system evolution understanding and different principles to solve contradictions concerning technical systems. The main goals are the creative thinking elaboration and inventive problem solving competence.

CONTENTS OF THE COURSE

1. Creative Approach Techniques

What is innovation? Science & technical creativity efficiency and its interaction with creative task solving techniques. Most cutting-edge inventive problem solving techniques. Heuristic. Control questions' technique. Synectics. Morphological Analysis and Morphological Tables. Psychological Inertia and how to overcome it.

Practice works

- 1.1. Task solving with associative thinking technique – 1 hour
- 1.2. Brainstorming (task solving) – 1 hour
- 1.3. Morphological tables – 1 hour
- 1.4. Psychological Inertia and how to overcome it. Training – 1 hour

2. Technical System Evolution

System – what does it mean? System's definition. Technical system development criteria: functional, technological, economical, anthropogenic. Ideal Technical System. System evolution stages. Technical System evolution laws in accordance with TRIZ. Contradictions as an uneven system development result.

Practice works

- 2.1. Contradictions in system – 2 hours
- 2.2. Laws in system evolution (Game play) – 2 hours

Conference week:

- Presentation “Technical system evolution”

3. The Ways to Overcome Technical Systems Contradictions

Su-Field as a model for technical system analysis. Technical system contradictions and the main principles to overcome contradictions. How to choose the principle in accordance with two contrary demands. The bridge between inventive tasks and physics. Physical and chemical effects. Geometry in inventions.

Practice works

- 3.1. Su-Field analysis (task solving) – 4 hours
- 3.2. Principles to overcome contradictions (task solving) – 4 hours
- 3.3. Physical, chemical effects in inventive tasks – 4 hours
- 3.4. Geometry in inventive tasks – 2 hours

4. Inventive Problem Solving Algorithm

Inventive Problem Solving Algorithm. Information & program ensuring for inventive task searching. MPV–analysis. Engineering ideas implementation.

Practice works

- 4.1. Inventive Problem Solving Algorithm – 2 hours
- 4.2. MPV–analysis – 2 hours

TEXTBOOKS

1. Olga B. Shamina. *Inventive Problem Solving*. Tomsk: Tomsk Polytechnic University Publishing House, 2013. – 98 pgs.
2. Olga B. Shamina. *Inventive Problem Solving: study aid*. Tomsk: Tomsk Polytechnic University Publishing House, 2014. – 94 pgs.

REFERENCES

1. Edward de Bono. *How to Have Creative Ideas*. London: Vermilion, McQuaig Group Inc., 2007.
2. Jones J. 1982. *Design Methods*. John Willey & Sons, New York, Toronto, Chichester, Brisbane, 1982.
3. John R. Dixon. *Design Engineering: Inventiveness, Analysis and Decision Making*, McGraw-Hill, 1966.
4. Gordon, William J.J. *Synectics: The Development of Creative Capacity*. New York: Harper and row, Publishers, 1961.

RATING

Studying activity category	Points
Part 1. Creative Approach Techniques	
Practice work № 1.1. Task solving with associative thinking technique	2
Self-study. Essay “Fantastic world”	1
Practice work № 1.2. Brainstorming and Synectics (tasks solving)	2
Self-study. Presentation about the most interesting inventions	3
Practice work № 1.3. Morphological tables	2
Self-study. Home task solving (report)	1
Practice work № 1.4. Psychological Inertia and how to overcome it. Training	2
Self-study. Home task solving (report)	1
Part 2. Technical System Evolution	
Practice work № 2.1. Laws in system evolution (Game play)	4
Practice work № 2.2. Contradictions in system	4
Conference-week	8
Technical system evolution (presentation)	
Totals on check point 1	30
Part 3. The Ways to Overcome Technical Systems Contradictions	
Practice work № 3.1. Su-Field analysis (task solving)	4
Self-study. Home task solving (report)	2
Practice work № 3.2. Principles to overcome contradictions (task solving)	4
Self-study. Home task solving (report)	2
Practice work № 3.3. Physical, chemical effects in inventive tasks	4
Self-study. Home task solving (report)	2
Practice work № 3.4. Geometry in inventive tasks	2
Self-study. Home task solving (report)	2
Part 4. Inventive Problem Solving Algorithm	
Practice work № 4.1. Task solving with IPS-Algorithm	6
Practice work № 4.2. MPV-analysis*	2
Totals on check point 2	60
CREDIT: Schedule for idea realization (presentation)	40
Course hours in total	100