Innovative Problem Solving using TRIZ
An IAS-sponsored Course – Spring 2008

Wednesdays, 2-5PM during spring semester 2008
ES 589 (NMT course number – subject to change)
Instructor: Doug Dunston (ddunston@nmt.edu)
Course website (available after Dec. 1): http://www.nmt.edu/~ddunston/TRIZcourse

Purpose:

Introduce participants to structured problem solving, a tool that enables scientists, engineers, and management personnel to generate innovative solutions to difficult product and process problems. The course will outline some of the most commonly-used TRIZ tools and bring participants to the point where they can confidently and effectively employ these tools to address product and process design problems.

Background:

This proposal centers on a specific structured problem solving tool known as TRIZ. TRIZ, a Russian acronym for *Teoriya Resheniya Izobretatelskikh Zadach*, or Theory of Inventive Problem Solving, is a methodology for innovative problem solving that focuses primarily on design problems. TRIZ is used to avoid compromise solutions (working towards "both/and" solutions instead of "either/or" ones) and to forecast likely evolutionary trajectories of technical systems (how a system might evolve in the future, and what the implications might be for managing R&D). TRIZ is frequently used by governmental agencies and Fortune 500 companies in tackling difficult design and manufacturing problems (examples include NASA, Ford, Kodak, Motorola, 3M, Dell, GE).

Dr. Doug Dunston (D.M.A. Music – Claremont Graduate University, B.S. Physics – Harvey Mudd College, M.A. Physics – UC Berkeley) is chair of the Humanities Department and an adjunct faculty in ChemE at NMT. His first worked with TRIZ at an NSF short course in 2000, and he has taught Engineering Science and ChemE course segments and introductory courses on TRIZ at NMT.

Learning Objectives:

At the end of this course students should be able to:

- Construct a cause effect chain to determine why something is happening
- Generate a functional model to define component-to-component and within-component issues
- Identify and solve engineering and physical contradictions
- Use expertise from outside their areas to get solutions for problems
- Learn and incorporate additional TRIZ tools on a just-in-time basis

Course Agenda:

Part I - Fundamentals

Brief historical introduction
Core TRIZ concepts: function, ideality (avoiding compromises), contradiction
Simple problem solving flow (subsequent tools may be fit into this flow)

Part II – Problem definition and communicating between problem solvers

Cause Effect Chains
Functional Modeling

Part III – Basic concept generation tools

Engineering Contradictions
40 Inventive Principles (common techniques drawn from study of 2+ million patents)
Physical Contradictions
Separation Principles (techniques to eliminate physical contradictions)

Part IV – Additional concept generation and problem definition tools

Chosen from the following in response to problems brought in by course participants:

1. Process Analysis
2. Trimming: Removing Unnecessary System Components
3. Trends in Technological Evolution
4. Scientific Databases of Physical Effects
5. S-Curves: Product Introduction and Adoption
6. Substance-Field Analysis: Abstract Modeling for Problem Solution (used in conjunction with 76 Standard Inventive Solutions)
7. 76 Standard Inventive Solutions: Generic Solutions Applicable to Substance-Field Models
8. ARIZ (Algorithm of Inventive Problem Solving)
9. Zone of Conflict
10. “Smart Little People”: Technique for Overcoming Psychological Inertia
11. Failure Anticipation Analysis
12. “9 Windows”: Incorporating Sub-systems and Super-systems into Problem Solving