Course Name:
Creativity and Problem Solving in Engineering

<table>
<thead>
<tr>
<th>Course Number: 20-024</th>
<th>Credit: 3</th>
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<tbody>
<tr>
<td>Program: Undergraduate/Graduate</td>
<td>Course Type: Technical required</td>
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<tr>
<td>Prerequisite: 4th year BS</td>
<td>Corequisite:</td>
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Course Description (Objectives):
This course covers the fundamentals of critical thinking, problem solving and creativity in engineering through engineering applications. It attempts to sharpen problem-solving skills of students and help them reach a higher level of talent to efficiently handle problems in engineering projects. The topics covered include problem definition, idea generation techniques, and critical thinking methodology. The course provides a systematic framework for improving problem solving skills and creativity.

Course Content (outline):
- Chapter 1: Intelligence and Creativity, Types of problems, Benefits of Efficient Problem Solving, Problem Prioritization Scheme
- Chapter 2: Cognitive Frames, Creative and Habitual Ways of Thinking, Language and Frames, Metaphors, Paradigms, Writing as Thinking
- Chapter 3: Critical Thinking, Structured Critical Reasoning, Fallacies in Logic, Types of Biases, Socratic Questioning, Types of Conceptual Blocks, Causes of Mental Blocks, Emotional Intelligence, Divergent Thinking, Visualization, Risk Taking,
- Chapter 4: Preliminary Steps in Problem Solving, Knowledge, Resources, Modeling, Psychological Engagement
- Chapter 5: Techniques for Problem Reframing, Dunker’s Diagram Method, Multiple Why’s Method, Statement-Restatement Technique
- Chapter 6: Root-cause Analysis, Kepner-Tregoe Problem Analysis
- Chapter 7: Idea Generation Techniques, Vertical Thinking, Lateral Thinking, Brainstorming, SCAMPER Method, Futuring, Analogy, Cross-Pollination, TRIZ Principles and Methodology
- Chapter 8: Kepner-Tregoe Decision Analysis, Kepner-Tregoe Potential Problem Analysis

References:
• Michalko, M. (2001), Cracking Creativity, the Secrets of Creative Genius, Ten Speed Press.