

## Summer Course Program

Solving Complex Problems: Structured Thinking, Design Principles and AI, Jul 25 - 29, 2022

	Understanding Problems	Finding Concepts	Systems Architecting	AI for Design	Epilogue
	Mon	Tue	Wed	Thr	Fri
8:30-9:00 AM	Light breakfast with Q&A				
09:00 – 10:25 AM	<b>S. Kim</b> <b>Session 1: Course intro, Understanding systems and complexity</b> - Functional thinking - Axiomatic Design Framework - AI for Design Fundamentals of Axiomatic Design (I) - Independence Axiom	<b>S. Kim</b> <b>Session 4: Concept generation and embodiment:</b> - Case study: System design approach to healthcare systems  Fundamentals of Axiomatic Design (II) - Information Axiom - What is a complex system?	<b>S. Kim</b> <b>Session 7: Complexity and Systems Design</b> - Software system design - Micro/Nano systems - Organizational systems	<b>S. Kim</b> <b>Session 10: AI for Design:</b> a new paradigm with hybrid intelligence	<b>S. Kim, H. Akay</b> <b>Session 13: AI for Systems:</b> Digital thread, I4.0, and Manufacturing Genomes  System architecting, functional thinking and systems integration. Review and wrap up.
	Break				
10:35 – 12:00 AM	<b>J. Gans</b> <b>Session 2: System Analysis Approach</b> - LL Projects - Definitions - Basics  Problem Definition - Up/Down thinking	<b>T. David, J. Gans</b> <b>Session 5: Developing structure:</b> Pitfalls, Tools, and Techniques for System Analysis  Systems analysis Checklist - System Analysis Steps - Example tools	<b>B. Atkins, J. Gans</b> <b>Session 8: Blue team innovation approach</b> - innovation approach - Understanding the customer - Find a solution	<b>J. Gans</b> <b>Session 11: Defense systems analysis examples</b> - Red Teaming - Back of Envelope modeling - Assessing with rigor - Summarizing results Story Telling - Elements of a story - Adding excitement - Presentation tips and tricks	<b>S. Kim</b> <b>Session 14: Final Project Presentations and Reflection (Milestone Five)</b>
	Lunch				
01:00 – 03:30 PM	<b>S. Kim, all</b> <b>Session 3: Project session I:</b> Choosing Problem to Solve; Concept Generation; Pre-course interview* ( <b>Milestone One</b> ).	<b>S. Kim, all</b> <b>Session 6: Project session II:</b> - Structured problem statement, concepts generation and refinement ( <b>Milestone Two</b> ).	<b>S. Kim, all</b> <b>Session 9: Project session III:</b> Critical concepts and Solution Generation ( <b>Milestone Three</b> )	<b>J. Gans, all</b> <b>Session 12: Project session IV:</b> Technical Review with Surgical Assessment. ( <b>Milestone Four</b> )	<b>S. Kim, R. Shin</b> <b>Session 15:</b> Final Project Presentations and Reflection Continued.  Summary, Recap & Epilogue <u>*Course concludes at 3:30 PM</u>
3:30 – 4:00 PM	Break and Q&A				
03:40 – 05:00 PM	Working Social Hour (TBD)	S. Kim Self-study, project Q&A	S. Kim Self-study, project Q&A	Course Dinner (Place TBD)	

\* Pre-class interview will be made a week before the class starts, individually with the course instructor, Prof. Kim.  
 Contact: Prof. Sang-Gook Kim, sangkim@mit.edu