

PROFESSOR SANG-GOOK KIM

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Dr. Kim is a professor in the Department of Mechanical Engineering at MIT, and currently serves as an acting director of the Park Center for Complex Systems. Professor Kim has spent his professional career equally in academia and industry, and has extensive experience in the design and commercialization of microelectromechanical systems, commonly known as MEMS. Prof. Kim has been an MIT Mechanical Engineering faculty member since 2000. His areas of research include MEMS by digital printing, piezoelectric micro actuators, energy harvesting, and assembly of carbon nanotubes. Dr. Kim received a B.S. from Seoul National University (1978), an S.M. from KAIST (1980), and a Ph.D. from MIT (1985) in mechanical engineering.

DR. HILARIO OH

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Dr. Oh is a Senior Lecturer in the Department of Mechanical Engineering at MIT. Dr. Oh spent 19 years in research on brittle fracture, fatigue, sheet metal forming, digital signal processing and wafer processing. He spent another 20 years in problem solving and in design for quality and productivity of semiconductor equipment and automotive parts and sub-systems. Dr. Oh received a B.S. from University of the Philippines, an M.S. from Purdue University, and a Ph.D. from University of California, Berkeley.

DR. TAESIK LEE

KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY (KAIST)

Dr. Lee is an assistant professor in the Department of Industrial & Systems Engineering at Korea Advanced Institute of Science and Technology (KAIST). He is also affiliated with MIT as a research engineer in the department of Mechanical Engineering. His research interest is in the area of product/system design, innovation, and understanding complex systems. Most recently, his work is on service system design, including health care delivery systems and container port service systems. Dr. Lee received a B.S. from Seoul National University (1997), and his S.M. (1999) and Ph.D. (2003) from MIT.

INFORMATION AND REGISTRATION:

Location: Free University of Bozen-Bolzano,
Via Sernesi 1, 39100 Bolzano (BZ), Italy
E-Building, Aula E422

Course Language: English
Date: 22.-24.06.2009
Tuition fee: Euro 2.000,-
Due date for payment: 29.05.2009

BANK TRANSFER

Account holder: Free University of Bozen-Bolzano
Bank account: Südtiroler Sparkasse - Cassa di Risparmio
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Payment reference: Axiomatic Design Summer School

Participation can only be confirmed by completing and sending the Registration Form, accompanied by the receipt of payment regarding the tuition fee, via E-Mail to science.technology@unibz.it or via Fax to +39 0471 017009 within the due date.

REGISTRATION FORM

Surname/Name:

Title:

E-mail:

Phone:

Fax:

Company/Institution:

Address:

Postal/ZIP Code:

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www.unibz.it/en/sciencetechnology/welcome/SummerSchool.html



FREIE UNIVERSITÄT BOZEN

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FREE UNIVERSITY OF BOZEN · BOLZANO

Axiomatic Design for Complex Systems

2009 AXIOMATIC DESIGN
SUMMER SCHOOL
22.06 – 24.06.2009

ORGANIZED BY
THE FREE UNIVERSITY OF BOLZANO (FUB)
FACULTY OF SCIENCE AND TECHNOLOGY
AND THE MASSACHUSETTS INSTITUTE OF
TECHNOLOGY (MIT)

COURSE SUMMARY

Learn how the Axiomatic Design (AD) helps top-down thinking when we design complex systems. This course will introduce design principles that will enable you to define problems free from preconceived solutions. The instructors will engage the course participants through interactive discussion using many industrial cases including, where possible, the participants' own problems.

Many of today's engineered systems, whether a very large-scale factory or a small-scale nanoproduct, are complex systems. When designing these systems, most challenging problems manifest at the system level, and decisions need to be made, often in the absence of understanding the complexity. In this course, you will learn how the Axiomatic Design principles enable you to overcome these challenges by identifying and reducing the complexity and by promoting functional, top-down design thinking.

We will introduce the basics of the Axiomatic Design approach, and will examine how each element of the Axiomatic Design process relates to complex systems design. We will present the latest developments of the Axiomatic Design approach to complex systems as well as a number of case studies and industrial examples ranging from large scale to nano-scale systems, from production systems to service organizations, and from design for six sigma to design for health care systems.

CASE STUDIES

The following are just three of many more examples that will be discussed during the seminar. Customer Value Focused Product and Service Design. The success rate of new products or services can be increased only by a consequent orientation at the customer value: the customer needs drive the buying decision! Especially in service design, the identification and communication of the customer benefit is often very difficult. You will learn how to identify systematically the customer needs and the relative customer requirements and how to define on their basis the functional requirements for product development. Design of Flexible and Efficient Manufacturing Processes. Modern production systems are

increasingly required to be flexible and adaptable to changing market demands, which adds to their structural and operational complexity. Starting from the Axiomatic Design based complexity theory we present a procedure that provides methodological guidance in the systematic complexity reduction and in the development of efficient, flexible and changeable industrial production systems. With the help of an example taken from medium-sized industry, the practical application is illustrated. Health Care System. The health care delivery system is one of the least studied complex systems. Can we maximize the productivity by streamlining the patient flow while providing the best patient care? We will present ways to understand the complex nature of these interactions, and finding systematic solutions will be presented. Attempts have been made to facilitate the patient flow, to avoid the bottleneck by creating fast tracks in the Emergency Department (ED) of hospitals. We have recently found that the patient flow can be drastically improved by redesigning the fast track system based on Axiomatic Design and the overall patient waiting time could be decreased drastically (~50%). Besides the discussion of many other interesting examples, instructors will engage the course participants through interactive discussions using their own problems and examples.

LEARNING OBJECTIVES

In this course you will learn how to:

- understand the causes of complexity in your project,
- recognize various mistakes in designing and operating complex systems,
- understand the benefits of functional, top-down thinking in solving complex design problems,
- make good decisions in design and operation of complex systems with the Axiomatic Design thinking and processes.

WHO SHOULD ATTEND

This course is suited to anyone who handles complex systems or design, and those who want to improve the quality and performance of their operations and decision making. Attendees will include managers and engineers from production and service industries as well as from the public sector and health-care.

PROGRAM OUTLINE

INTRODUCTION: UNDERSTANDING COMPLEX SYSTEM DESIGN

- Understanding Complexity
- Design (synthesis) vs. analysis
- Functional thinking

FUNDAMENTAL CONCEPTS: AXIOMATIC DESIGN (AD)

- Design Domains and Design decomposition - Top-down design process
- Functional independence and information contents
- Axiomatic Design in various design contexts
- Other design tools and methodologies

CASE STUDIES AND EXAMPLES

- Customer Value Oriented Product and Service Design
- Design to Simplicity: Efficiency improvement in Industrial Production Systems
- Vehicle (automotive) system design
- Design of a health care delivery system
- Micro-nano system design
- Design of an IC wafer processing system (Track machine)

ABOUT THE LECTURERS

PROFESSOR DOMINIK T. MATT

FREE UNIVERSITY OF BOZEN/BOLZANO (FUB)

Dr. Matt is a professor in the Faculty of Science and Technology at the Free University of Bolzano. Professor Matt studied mechanical engineering in Germany at the Technical University of Munich and received a Ph.D. from the University of Karlsruhe. He has many years of professional experience in the fields of logistics, operations, business economics and strategy acquired in various positions at Camelot Is-2 in the United States, at the BMW Group in Munich and Solihull (UK) and in international Management Consulting. In 2004, he was appointed to the post of a Professor for Production Systems and Business Economics in the School of Industrial Engineering and Management at the Polytechnic University of Turin, Italy. In 2008, he accepted a call of the Free University of Bolzano to a tenured professorship at the Faculty of Science and Technology. His areas of research include the analysis and design of complex systems, and product/service innovation.