INTERNATIONAL ASSOCIATION FOR Axiomatic Design

INTERNATIONAL

Summer SCHOOL

1st IAAD International Summer School on

AXIOMATIC DESIGN - SYSTEMS ENGINEERING AND DESIGN OF COMPLEX SYSTEMS

19th-21th July 2022

The summer school aims at teaching both scientific foundations, practical methods and helps to develop specific professional skills.

unibz Unimarconi MIT WPI PURDUE UNIVERSITY Utrecht University

Contact for registration of external applicants:
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Fundamental principles of **Axiomatic Design (AD)** are reviewed, with insights and perspectives of over 30 years of teaching and practice. This should be of interest to beginners and to all levels of users. The latest methods for using AD, qualitatively and quantitatively, for selecting the best design solutions and for fostering innovations are presented. AD, originating with Nam Suh at MIT in the late 1970s, contends that all good designs comply with two axioms: maintaining independence of the functional elements and minimizing information content. AD can add value and reduce costs in designs and in the design process. Participants learn also to use **Acclaro DFSS software** for the design of complex systems and products.

This tutorial is intended students, PhD students, researchers and design practitioners, who might have never used Axiomatic Design as design theory, or who would like a fresh perspective.

Content Outline

LECTURE:

1. Introduction in Axiomatic Design (AD)
2. Domains in AD
3. Customer Needs, Functional Requirements, Design Parameters, Process Variables and Constraints
4. Independence Axiom and Information Axiom
5. Design Matrix
6. Decomposition and Mapping process
7. MSDD design approach
8. Design of Complex Systems and practical examples (Software System Design and Integration, Mechanical and Re-Design of Manufacturing Systems, Manufacturing System Design, Design of Cyber-Physical Systems)

Exercise

- Case study elaboration in groups during the exercise hours.
- Introduction in Acclaro DFSS software for engineering design and application in the group work.

The lectures of the summer school will be offered in remote by international experts in Axiomatic Design via live streaming.

The exercise part is instead planned as a presence group work session in participating universities.

In case of limitations due to the Corona Virus the whole summer school can be held in remote.

Agenda Summer School

TIME ZONE (CET)

LECTURES

TUESDAY 19 JULY 2022
AXIOMATIC DESIGN AND DESIGN OF COMPLEX SYSTEMS

2:00 – 2:15 pm **Welcome** (Gabriele Arcidiacono, Luca Gualtieri)

2:15 – 3:00 pm **Lecture 1 - Origins of AD and Axioms** (Nam Suh)

3:00 – 3:45 pm **Lecture 2 - Functional Thinking in System Engineering** (Chris Brown)

3:45 – 4:00 pm **Break**

4:00 – 4:45 pm **Lecture 3 - Basics of Axiomatic Design** (Chris Brown)

4:45 – 5:30 pm **Lecture 4 - Example of an AD application for problem solving** (Erik Puik)

5:30 – 6:00 pm **Question and Answer**

WEDNESDAY 20 JULY 2022
ADVANCED CONCEPTS AND APPLICATIONS OF AXIOMATIC DESIGN

2:00 – 2:15 pm **Wrap up Day 1**

2:15 – 3:00 pm **Lecture 5 - AD for mechanical engineering problems** (Joey Foley)

3:00 – 3:45 pm **Lecture 6 - Collective System Design and MSDD** (David Cochran)

3:45 – 4:00 pm **Break**

4:00 – 4:45 pm **Lecture 7 - AD for healthcare systems design** (Miguel Cavique)

4:45 – 5:30 pm **Lecture 8 - Design of inclusive workplaces in manufacturing** (Erwin Rauch)

5:30 – 6:00 pm **Question and Answer**

GROUP WORK

WEDNESDAY 20 JULY 2022
GROUP WORK PART 1
(with local Tutors)

8:00 – 8:15 am
Problem formulation

8:15 – 10:00 am
From CN to FR and C
short presentation

10:00 – 10:15 am Break

10:15 – 12:00 am
Top level FR-DP
short presentation

THURSDAY 21 JULY 2022
GROUP WORK PART 2
(with local Tutors)

8:00 – 10:00 am
Decomposition, FR-DP tree, Acclaro software

10:00 – 10:15 am Break

10:15 – 12:00 am
Decomposition, FR-DP tree, Acclaro software

THURSDAY 21 JULY 2022
GROUP WORK PART 3
(with local Tutors)

14:00 – 15:45 pm
Design representation and power point preparation

15:45 – 16:00 pm Break

16:00 – 17:15 pm
Group presentations and discussion

17:15 – 18:00 pm
Evaluation and Award Winners

CASE STUDY IN THE EXERCISE HOURS: Decomposition of a given or own case study
TUTORING: an IAAD member takes over the local tutoring for group works.

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