Name: **Design Research Methodology and Design of Smart Products**

Course No: Y0120091

Lecturer: Prof. Imre Horváth，Dr. Zoltán Rusák, Faculty of Industrial Design Engineering TU Delft

Contact person：Hou Yuemin

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Language: English

The examination form: Research design and plans using the methodology taught in the course.

Hours: 16 hours

Credit: 1

Time: June 17th-19th, 2013

Venue: Room 305, Teaching Building No.1, CAD Center (North side), Tsinghua University

June 17th: 9:30-12:00, 14:00-16:00

June 18th: 9:3012:00, 14:00-16:00

June 19th: 9:30-12:00, 14:00-17:00

June 21th: 9:30-12.:00, Students are supposed to present their research design and plans using the methodology taught in the course and professors will give back feedback on their planning

Enrolment requirement: graduate students (also welcome to interested teachers and students)

Registration: before the class or on site on the first class

Introduction to the course:

Outline:

Part 1: **Design Research Methodology**

Morning sessions: 9:30-12:00am

Lecturer: Prof. Imre Horváth

Faculty of Industrial Design Engineering, TU Delft

Morning Session One – Principles of science (Morning of June 17th)

- ☐ Scientific reasoning and criteria
- ☐ Objectives of science
- ☐ Scientific knowledge
- ☐ Topography and kinds of design knowledge
- ☐ What is scientific research?
- ☐ Fundamental or basic research
- ☐ Applied research

☐ Operative research

☐ Organizational aspects

☐ Methodological aspects

Morning Session Two – Process of inquiry (Morning of June 18th)

☐ Concept of research cycles

☐ Framing research cycles

☐ Research in design context

☐ Design inclusive research

☐ Operative design research

☐ Handling context in design research

☐ Various classifications of research methods

☐ Standard and non-standard research methods

☐ Common research techniques

☐ Research designs

Morning Session Three – Methodological framing of design research (Morning of June 19th)

☐ Mixed method research

☐ Research questions

☐ Research hypotheses

☐ Managing research variables

☐ Justification of theories

☐ Internal validation

☐ External validation

☐ Issues of sampling

☐ Designing experiments

☐ Statistical assessments

Part 2: **Design of smart products with Matlab/Simulink**

Afternoon Session: 14:00-16:00 (June 17th-18th), 14:00-17:00 (June 19th)

Lecturer: Dr. Zoltán Rusák, Faculty of Industrial Design Engineering, TU Delft

Afternoon Session one: Intelligent algorithms of Matlab/Simulink

Afternoon Session two: Using computer vision algorithms as sensors of smart systems

Afternoon Session three: Reasoning and decision making using state machine

Afternoon Session four: Case study of adaptive lighting system

Part3： Presentation and Evaluation

June 21th: 9:30-12.:00

Students are supposed to present their research design and plans using the methodology taug ht in the course and professors will give back feedback on their planning.

Introduction to the Lecturers

Prof. Dr. Imre Horváth, Delft University of Technology

Imre Horváth is a full professor and head of Section Computer Aided Design Engineering, at the Faculty of Industrial Design Engineering of the Delft University of Technology, the Netherlands. He received his M.Sc. diploma in mechanical engineering (1978) and in engineering education (1980) from the Technical University of Budapest, Hungary. He was working for the Hungarian Shipyards and Crane Factory between 1978 and 1984. He had various faculty positions at the Technical University of Budapest between 1985 and 1997. He earned a dr.univ. title (1987) and a Ph.D. title (1994) from the TU Budapest, and a C.D.Sc. title from the Hungarian Academy of Sciences (1993). Since 1997 he is a full professor of Computer Aided Design and Engineering at the Faculty of Industrial Design Engineering of the Delft University of Technology. From 1st January 2005 until May 2007 he was the director of Research of the Faculty. He is guest editor of 16 special issues of various journals (e.g., CAD, JED, JCISE, CiI, IJPD) and editor of 10 conference proceedings. He has written 43 journal papers and 97 refereed conference papers as first author, and co-authored more than 260 journal papers and conference papers. He received 4 best paper awards (e.g., from ASME, ICED). He initiated the Tools and Methods of Competitive Engineering (TMCE) International Symposiums and has been its general chairman for 19 years. He is co-editor-in-chief of the Journal Computer Aided Design since 2004, and member of the Editorial Advisory Board of Journal of Engineering Design since 1998. He is acting as advisory editor for the Journal of Mechanical Engineering. He served in various positions on the Executive Committee of the CIE Division of the ASME, and was the conference chair of the 2006 CIE Conference, chair of Division in 2007, and past chair in 2008. He has been reviewer for several international journals and conferences. He obtained Doctor Honoris Causae title from the Budapest University of Technology and Economics, Hungary in 2009, and Professor Honoris Causae title from the University of Miskolc, Hungary in 2010. His primary research interests are in philosophical and theoretical aspects of design research, computer support of

experiential design, design support tools based on ubiquitous technologies, formalisation and structuring of design knowledge, and product innovation based on technological affordances in social contexts. He was invited to deliver several keynotes and tutorials at outstanding international conferences and workshops. He has proposed a comprehensive methodology for framing design research. As educator he is currently interested in computer application in conceptual design, integrating research into design education, and heterogeneous platform-based learning environments.

Dr. Zoltán Rusák,
Assistant professor, Industrial Design Engineering, Delft University of Technology

Zoltán Rusák is an assistant professor at the Section of Computer Aided Design Engineering at the Faculty of Industrial Design Engineering, of the Delft University of Technology, the Netherlands. He obtained his master degree in the field of mechanical engineering from the Budapest University of Technology and Economics in 1998. He earned his PhD in Computer Aided Design Engineering from the Delft University of Technology in 2003. His research interest includes computer support of geometric modelling, use process simulation in virtual reality environments, and mobile, portable and ubiquitous computing for design applications. He is the general secretary of the Tools and Methods of Competitive Engineering biannual symposia. He was the PhD mentor of the Faculty of Industrial Design Engineering.