CHALMERS
UNIVERSITY OF TECHNOLOGY

# CDIO Faculty Development Course

**25th and 26th October 2016**
**at The Department of Product & Production Development,**
**Chalmers University of Technology**

cdio CONCEIVE DESIGN IMPLEMENT OPERATE™

*The CDIO™ INITIATIVE is an innovative educational framework for producing the next generation of engineers. The framework provides students with an education stressing engineering fundamentals set in the context of Conceiving — Designing — Implementing — Operating (CDIO) real-world systems and products.*

## About the course

The CDIO Faculty Development Course focuses on imparting knowledge about CDIO, and how to integrate innovation, entrepreneurial and business skills in the technical programmes to the participants who are engaged in teaching and development of MSc programmes.

The 2-day course contains multiple lectures and case studies where the speakers will share their experiences. The participants will develop skillset and ideas for developing CDIO based projects and improve teaching methods into their respective MSc programmes and teaching.

## Learning outcomes

After the course, participants will be able to

1. Explain the rationale of the CDIO approach to engineering education.
2. Apply the CDIO methodology to curriculum development, including
   a. Formulating learning outcomes on the program level
   b. Devising a curriculum to integrate disciplinary fundamentals with personal and pro fessional skills and attitudes, in particular business and entrepreneurship skills
   c. Giving examples of strategies to enable and drive program-driven course development

3. Apply the CDIO methodology to course development, including
   a. Formulating learning outcomes on the course level
   b. Developing appropriate learning activities for discipline-led learning and for problem based/project organized learning
   c. Developing appropriate assessment methods aligned with the intended learning out comes
   d. Suggesting ways to address business and entrepreneurship skills on the course level

## Registration

The course is free for partner universities in the CDIO EIT Raw Material Project, although seats are limited.

**Deadline for registration is October 7, 2016.**

Click here to register for the course

# Session Schedule

**Venue:** M-Building, Department of Product & Production Development, Chalmers University of Technology, Hörsalsvägen 7a, Gothenburg, Sweden

**Date:** 25th and 26th October, 2016

*Note: Changes may occur in the Session Schedule*

| Date | Topics | Duration | Given By | | Location | Time |
|---|---|---|---|---|---|---|
| 25th Oct. Tuesday | Registration | 30 min | | | Dep. of PPD | 8:30 – 9:00 |
| | Introduction to CDIO | 1 hr | Chalmers | Johan M | Dep. of PPD | 9:00 – 9:45 |
| | Program Development | 1 hr | Chalmers | Johan M | Dep. of PPD | 10:00 – 10:45 |
| | Course Development | 1 hr | KTH | Kristina E Jakob K | Dep. of PPD | 11:00 – 11:45 |
| | Lunch | 1 hr | | | | 11.45 – 13.15 |
| | Course Development (cont.) | 1 hr | KTH | Kristina E Jakob K | Dep. Of PPD | 13:15 – 14:00 |
| | Industrial Engagement on Teaching | 1 hr | UL | Ann L | Dep. of PPD | 14:15 – 15:15 |
| | CDIO Case Study- Program Development | 2 hr | Chalmers | Johan M Mikael E | Dep. of PPD | 15:15 – 16.00<br>16:15 – 17:00 |
| 26th Oct. Wednesday | CDIO Tools for Teaching Material - Case Study on Product Development Course | 2 hr | Chalmers | Johan M Lars A | Dep. of PPD | 09:00 – 9:45<br>10:00 – 10:45 |
| | CDIO – Case Study on Course Development | 1 hr | UL | David T Alan R | | 11.00-11.45 |
| | Lunch | | | | | 11.45 – 13.15 |
| | Design Build - Simulation Based Learning | 2 hr | Chalmers | Mikael E | Dep. of PPD | 13:15 – 14:00<br>14:15 – 15:00 |
| | CDIO- Business and Entrepreneurship | 1 hr | UL | Lisa O | Dep. of PPD | 15:15 – 16:00 |

# Speakers

Email: lars.almefelt@chalmers.se

## Dr. Lars Almefelt

*Vice Head of Department, Senior Lecturer, Div. of Product development, Dep. of Product and Production Development, Chalmers University of Technology*

Dr. Lars Almefelt is specialized in methodology for product innovation which is the core of his teaching and research. Specifically, he is skilled in management of requirements, with focus on the role of requirements in product innovation.

His work typically concerns products that integrate many different technologies and often include mechanics, software and services. He frequently takes part in multi-disciplinary research projects that involve many parties and subject areas. His research themes include: Balancing of requirements and synthesis of product concepts, Methodology for service innovation, Multi-disciplinary product innovation, and Designing products from a lifecycle perspective.

Dr. Almefelt is also responsible for product development project course which is the central theme for the Masters Programme in Product Development at Chalmers University of Technology. The project course is a CDIO based multi-disciplinary project where students develop innovative solutions to the different problems posed by the industry by using knowledge from his teachings.

Email: kristina@kth.se

## Kristina Edström

*Associate Professor / CDIO Program Leader, KTH Royal Institute of Technology*

Kristina Edström is an educational developer with an engineering background (MSc in Eng, Chalmers), Associate Professor in Engineering Education Development at KTH Royal Institute of Technology, Stockholm, Sweden. She is engaged in engineering education development and research at KTH, in Sweden and internationally – most notably in the CDIO Initiative since 2001.

She is the program leader for KTH Royal Institute of Technology since 2005, and a contributor in Crawley et al (2007; 2014) Rethinking Engineering Education: The CDIO Approach, Springer. She is a member of the CDIO Council. Her research focuses on the conditions for improvement of engineering education.

# Speakers

Email: mikael.enelund@chalmers.se

## Dr. Mikael Enelund

*Professor, Department of Applied Mechanics, Chalmers University of Technology*

Dr. Mikael Enelund is a Professor in Structural Dynamics and head the MSc program in Mechanical engineering at Chalmers. His current research focuses on modeling and optimization of damping and on engineering education developments.

Dr. Enelund has a strong background in educational development, mostly within the CDIO-initiative. Recent developments include integrated computational mathematics education, integrated education for sustainable development and global capstone projects in the Mechanical Engineering program. He has an extensive experience in developing and teaching courses ranging from basic courses in Mechanics and Strength of Materials to advanced courses in Applied Mechanics, Finite Elements and Structural Dynamics.

Dr. Enelund received the Chalmers pedagogical award 1999 and 2010 and has six times been awarded "Best Teacher of the Year" by the Mechanical Engineering students. In 2005, he was appointed head of the MSc Eng. programme in mechanical engineering at Chalmers. Under his leadership, the program was awarded Centre of excellence of higher education 2008 by the National Swedish Agency for Higher Education.

Email: jakob@kth.se

## Dr. Jakob Kuttenkeuler

*Professor at KTH Centre of Naval Architecture*

Dr. Jakob Kuttenkeuler is Professor in Naval Architecture and has participated in the development of the CDIO model since the start in 2000. His main research interests are in high-speed craft design, fluid-structure interaction and lightweight solutions.

He has developed the KTH Master program in Naval Architecture and teaches a range of topics ranging from propellers, hydromechanics, maneuvering, and ship design to sailing mechanics.

He is responsible for the doctoral program in Vehicle and Maritime Engineering. Jakob Kuttenkeuler received the KTH Prize for Outstanding Achievements in Education in 2001.

# Speakers

Email: Ann.Ledwith@ul.ie

## Dr. Ann Ledwith

*Director of Continuing & Professional Education,*
*University of Limerick*

Dr. Ann Ledwith has a very vast experience in teaching and is Director of Continuing & Professional Education at University of Limerick, Ireland. Her core competencies and research interests are: New Product Development, Project Management, Innovation Management, Technology Management, Online and Blended Teaching Methodologies.

Research Centre: Enterprise Research Centre, University of Limerick, Ireland

Email: johan.malmqvist@chalmers.se

## Dr. Johan Malmqvist

*Professor of Product Development, Dean of Education, CDIO Co-director, Department of Product and Production Development, Chalmers University of Technology*

Johan Malmqvist, co-author of "Rethinking Engineering Education - The CDIO Approach", is chair professor in product development at Chalmers University of Technology in Gothenburg, Sweden. He obtained his PhD from Chalmers in 1993 and was appointed chair professor in 2005.

His research focuses on development methodologies and IT support for product development (PLM). The results include new design methods and IT tools, but also empirical studies of product development practices. The research is conducted in close collaboration with Swedish industry. Current projects investigate methods and tools for development of product-service systems and knowledge-based engineering tools.

Dr. Malmqvist is also heavily engaged in the renewal of engineering education. As a dean of education, he is responsible for Chalmers education programs in mechanical, automation, industrial design engineering as well as the naval programs. Malmqvist was one of the co-founders of the Conceive-Design-Implement-Operate (CDIO) Initiative, an international effort that aims to develop a new vision for engineering education.

# Speakers

Email: alan.ryan@ul.ie

## Dr. Alan Ryan

*Lecturer & Director of the Materials & Automation Research group*
*University of Limerick*

Dr. Alan Ryan is a lecturer in Sustainable Automation, Quality Management & Supply Chain in the Department of Design & Manufacturing Technology. He is director of the Materials & Automation Research group.

Alan's research interests include process optimisation, quality management systems and sustainable treatment of products at the end of their useful life. Alan's industrial background working as a manufacturing engineer for a leading multinational electronics manufacturer and uses this industrial background in his approach to research, lecturing and problem solving.

Alan is a member of Engineers Ireland, has developed new systems and technologies which have been patented and licenced to spin-out companies. He jointly led UL's admission into the CDIO community, which is a move towards making engineering lecturing more problem based. The aim here being to help students grasp key concepts and to provide an industry ready graduate.

Email: lisa.odonoghue@ul.ie

## Dr. Lisa O'Donoghue

*Lecturer, University of Limerick*

Dr. O'Donoghue is a Ph.D. Scientist who has recently received the Young Entrepreneur of Year Award (2010), Molex-Kriebel Award for Innovation in Global Business and Technology (2010) and the JCI Outstanding Young Person of the Year Award in Science and Technology in Ireland (June 2011). Dr. O'Donoghue holds a first class honours degree in Materials Science and Technology and a doctorate in High Temperature Technology in Aero Gas Turbines Engine applications.

She is the lead inventor of the LCD recycling technology while leading research at the University of Limerick. She has since set up a spin out company Votechnik and has licensed the technology to take it to the global market.

She has a varied background in leading industrial focused research in multidisciplinary fields such as automated recycling systems, abrasives technology, process optimization of industrial electroplating systems and others. She also gives lectures at the University of Limerick on the topic of Materials Processing and is supportive of linkages between Material Science & Engineering and Entrepreneurship & Business.

# Speakers

Email: david.tanner@ul.ie

## Dr. David Tanner

*Senior lecturer, University of Limerick*

Dr. David Tanner received his degree (BA, BAI) in Mechanical / Manufacturing Engineering from Trinity College, Dublin in 1995. He then moved to the University of Limerick, where he completed his PhD entitled "Measurement and finite element prediction of residual stresses in aluminium alloy 7010 forgings" with Dr JS Robinson. After a one year post-doc at the University of Limerick, he worked from 1999 to 2001 with Alcan International research laboratories in Banbury, UK, on prediction and testing of the performance of aluminium joints for applications in the Jaguar XJ8.

David returned to the University of Limerick in 2001 to work on a transmission electron microscopy (TEM) based project investigating welding technology of power plant steels (SmartWeld). He managed the TEM facility at the Materials and Surface Science Institute (MSSI) prior to obtaining a position as lecturer in Manufacturing Process Technology in September 2005 in the Manufacturing & Operations Engineering Department.

David is now a member of the MSSI and continues to undertake research in the areas of TEM and finite element analysis of metal working processes. He is currently the course leader for the Bachelor of Engineering degree in Design and Manufacture and is involved in industrially relevant research projects in the areas of investment casting and brazing technology.

## About Chalmers University of Technology


Founded in 1829, Chalmers is a highly progressive university situated in Gothenburg, Sweden and known locally and globally for education, research and innovation with a wide range of applications. The university focuses on research and education in technology, natural science and architecture.

With more than 11000 students and 2500 employees, approximately 40 percent of Sweden's graduate engineers and architects are educated at Chalmers. Each year, over 200 graduate and over 800 undergraduate degrees are awarded. More than 3000 graduate students attend programs at the university. The International student population is around 40% of all students at the undergraduate and graduate level.
For more information, please visit www.chalmers.se/en

Chalmers was one of the four original universities behind the CDIO initiative. Today, Chalmers is the host for the CDIO office, CDIO webpage and has one of the two leader roles in the CDIO initiative. For more information, please visit www.cdio.org

## About Gothenburg, Sweden

Gothenburg (Swedish: Göteborg) is the second-largest city in Sweden and the fifth-largest in the Nordic countries. Situated by the west coast of Sweden, the city has a population of 549,789, with 549,839 in the urban area and 982,360 inhabitants in the metropolitan area.

For more information, please visit **http://www.goteborg.com/en/**

## Travel and Accommodation

- Accessibility by Air: Göteborg Landvetter Airport (GOT )
  Airport bus runs every 15-20 minutes and takes around 20 minutes to city center (Central Station/Nils Ericson Terminal)
- Accessibility by Rail/Bus: Göteborg Centralstationen, Nils Ericson Terminal
- For local transportation with trams/busses
  For Tickets to local transportation
- To reach Chalmers via Tram/Buss Stop: Chalmers, Chalmers Tvärgata
- For accommodation

## Contact information

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## About the project

This course is funded by EIT Raw Material. Existing MSc programmes which are linked to the thematic Raw Material content are often very technical and students graduates as professional students who knows how to solve well defined and often non-realistic problems. Students in such programmes seldom practice entrepreneurial, communication and innovation skills.

However the CDIO initiative focuses on implementing the entrepreneurial thinking into such technical programmes. By implementing CDIO, students will get more of real problems which are cross disciplinary, includes societal and business aspects and are complex and ill-defined for which 'one right answer' are exceptions etc. Another result of CDIO implementation is that students will be better prepared for necessary working skills through a better understanding of the engineering process and the whole raw material chain.

**Sponsors and Partners:**

- Luleå University of Technology, Sweden
- TU Clausthal, Germany
- TU Delft, Netherlands
- UP de Madrid, Spain
- University of Limerick, Ireland
- Chalmers University of Technology, Sweden
- LKAB, Sweden
- RUSAL Aughinish Alumina, Ireland
- SP, Sweden

**Learn more about CDIO at [www.cdio.org](http://www.cdio.org)**