



PhD student course: Parametric design

*The centre for Lean wood engineering welcomes you to
a PhD student course in parametric design!*

Background and goal

Effective construction design is characterized by standardization and reuse. The traditional way of approaching this was to standardize by repetition; cast all elements in the same form. A more modern way of thinking is that we study a given context to learn more of the 'operative landscape', the design-space within which the product is to be designed, manufactured and used, and then build product models to take advantage of this parametric space. Parametric design offers ways of making the work on the engineering desktop (e.g. CAD) more effective by creating product models that can multiple types of information (data-types) that can be used to build parametric relationships and help us create variable products and increase reuse.

A parametric product model can be used to configure standardized products infinitely within the given solution-space; the standardized product no longer needs to be 'cast in the same form'. Parametric model also lets us swiftly try **what-if**-scenarios and thus increases the number of possible design iterations. Incorporated information can also help designers see the downstream process (e.g. design preparation, production, assembly) effects of design changes. A parametric model can of course be created in several ways by e.g. connecting a geometric dimension to another, by using a programming language, etc.

In order to create a useful parametric product model it is important to understand the structure of the product parts and how these parts are related to each other, and to avoid building 'spaghetti'-relationships. It is also important to understand the company processes related to the product parts and the inherent constraints these contain. We will use UML (Unified modeling language) as a method to model and visualize good object-oriented and modular product structures and processes.

The goal of this course is to understand how to construct effective parametric design by building useful, transparent and reusable product models.

Course dates and themes (all during 2008)

Part I	September 30 (v.40) Luleå/by Marratech ¹	Introduction
Part II	October 12 – 19 (v.42) San Francisco/recorded ²	Stanford trip
Part III	November 25-27 (v.48) Luleå	<i>Day I</i> Workshop UML <i>Day II-III</i> Workshop CAD
Part IV	Dec 9 (v.50) Stockholm	Examination

The course starts with an introduction to get into the area and be prepared with questions and ideas for the Stanford trip. The project work is also introduced so that all later course parts can be coupled to the project work. At Stanford the CIFE (Centre for Integrated Facility Engineering) and construction sites and/or construction companies are visited. At CIFE lectures and workshops will be held. The course will be facilitated through a WIKI (a website where all project members can upload information, edit documents and discuss ideas and issues) and this is introduced through a WIKI-workshop. The next part is a UML-workshop and a CAD-workshop. During day one UML is trained to create product

¹ Marratech is software for distributed meetings, download at <http://www.ltu.se/its/d1321/1.4256?l=en>.

² The Stanford lectures will be recorded and made available on the internet for future reference.



structures with connections to processes. During day two and three the focus is on how to use CAD-tools to create parametric and modular product models and couple more information to the product model by means of knowledge-based engineering. The intermediate time can be used for project work. The course is examined by an oral presentation and a written report of the project work. The course WIKI is also used as a tool for examination.

Locations

Division of Structural Engineering
Department of Civil, Mining and Environmental Engineering
Luleå University of Technology
F-building
SE-971 87 Luleå, Sweden
<http://www.ltu.se/shb/2.2079?l=en>

Centre for Integrated Facility Engineering, Stanford University
The Jerry Yang & Akiko Yamazaki Environment & Energy Building
473 Via Ortega, Room 292, MC:4020
Stanford, CA 94305-4020, USA
<http://cife.stanford.edu/>

Stockholm, details to be decided.

Organizers

Examiner is Helena Johnsson, helena.johnsson@ltu.se
Questions about course contents: Marcus Sandberg, marsan@ltu.se
Questions about Stanford visit: Thomas Wingate, thomas@wingate.se

How to apply

Apply by sending an email to LWECordinator@ltu.se at the latest 2008-08-20. Also include a couple of rows of your expression of interest, including a brief introduction to your own research.

Course level

The course is given at PhD level. The course encompasses CAD, parametric modeling and object-oriented design. Teaching is flexible and given at the level of the PhD student.

Examination

The course is examined by an oral presentation and a written report of the project work. The course WIKI is also used as a tool for examination. Participating students are required to attend (physically or by distance) all four course parts. The following grades are available: fail/pass. The course accounts for 7.5 local/ECTS credits.

Others

Centre for Lean Wood Engineering (LWE) pays trip and accommodation for PhD students in LWE for the week in the USA. Other course participants are responsible for funding their trip. The number of participants is limited to 15 persons. If more than 15 persons apply PhD students in LWE have priority.

Lean wood engineering homepage: <https://www.ltu.se/lwe?l=en>