COURSE SYLLABUS

Non-linear Finite Element Analysis, 6 credits

Olinjär FEA, 6 högskolepoäng

Course Code:	TOLR28	**Education Cycle:**	Second-cycle level
Confirmed by:	Dean Apr 6, 2018	**Disciplinary domain:**	Technology
Valid From:	Aug 1, 2018	**Subject group:**	MT1
Version:	1	**Specialised in:**	A1N
		Main field of study:	Product Development

Intended Learning Outcomes (ILO)

After completing the course, the student shall;

Knowledge and understanding

- display knowledge of basic principles of nonlinear FEA, in particular the disciplines of contact mechanics and plasticity
- display knowledge of understanding for derivations of FEA methods from governing equations.

Skills and abilities

- demonstrate the ability to perform nonlinear FEA of real engineering problems such that a drop test or sheet metal forming
- demonstrate the ability to read a scientific paper within the field of nonlinear FEA without any need for understanding of the details.

Judgement and approach

- demonstrate the ability to suggest appropriate analysis for different types of problems
- demonstrate the ability to judge and criticise results from a finite analysis.

Contents

The course includes the following topics:

- Strong and weak formulations of a one-dimensional problem.
- Finite element formulations, (strong and weak formulations), iso-parametric formulation, numerical integration.
- Linear elasticity, continuum mechanics, stress, strain, balance laws, Eulerian and Lagrangian formulations.
- Contact mechanics, Signorini's contact conditions, trial and error approach, penalty formulation, augmented Lagrangian formulation, Newton's method, the KKT-conditions.
- Plasticity, associative plasticity, the principle of maximal dissipation, J2-plasticity, radial return, isotropic hardening.
- Projects and tutorial using Matlab and Abaqus.

Type of instruction

The teaching is conducted in English.

Prerequisites

The applicant must hold the minimum of a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in mechanical engineering, or equivalent. The bachelor's degree should comprise a minimum of 21 credits in mathematics, including at least 6 credits in multivariate calculus. Proof of English proficiency is required.

Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Written exam[I]	5 credits	5/4/3/U
Project work	1 credit	U/G

[I] Determines the final grade of the course, which is issued only when all course units have been passed.

Course literature

Literature

Lecture notes, distributed digitally.