Course description obligatory courses

Transportation Engineering and Logistics (TEL) 2009-2010

ME1400	Sustainability in Transportation Engineering	ECTS: 3

Subject of the course is the sustainability in the transportation and production engineering and logistics. The course covers:
• Use of material and energy resources
• Energy production and storage
• Efficiency of transport systems: Transport loss factor, effect kinetic energy, energy recuperation and transmission
• Product life cycle and sustainable product design
• Sustainable processes and supply chains
• Economical aspects of sustainability

Book: -

SC4081	Knowledge Based Control Systems	ECTS: 4

Main objective: understand and be able to apply 'intelligent control' techniques, namely fuzzy logic and artificial neural networks to both adaptive and non-adaptive control.

The course covers:
Theory and applications of knowledge-based and intelligent control systems, including fuzzy logic control and artificial neural networks:
• Introduction to intelligent control
• Fuzzy sets and systems
• Intelligent data analysis and system identification
• Knowledge based fuzzy control (direct and supervisory)
• Artificial neural networks, learning algorithms
• Control based on fuzzy and neural models
• Reinforcement learning
• Examples of real-world applications

Book: Reader Knowledge-Based Control Systems SC4081 Version January 2010

WB3410-03	Large Scale Transportsystems	ECTS: 3

Subject of this course are mondial cargo flows mainly in the non-bulk area, the so called general cargo. This course concentrates on the phenomenon container transport, a spectacular logistical break-through in the sixties of the last century. Initially the container was succesful for sea transportation, but more and more intermodal developments also control the long distance land transportation and integrate in domestic logistics. The specific characteristics of the various transport modes and the development in infrastructure determine the suitability of transport modes for the demands of large scale logistics. Technological developments, social economical consequences and particularly the role of container transport in the process of globalisation of the industrial production will be discussed. The ongoing urbanisation puts increasing demands on city logistics including the connection to intermodal transport.

Book: -

WB3416-03	Design with the Finite Element Method	ECTS: 3

The main goal for the course is to learn using FEM (Finite Element Modeling) software as a design tool. The assignment for this course is to structurally design a crane with the aid of finite element program ANSYS. Choose 1 crane (or ship loader or unloader) from a large library of cranes and structurally design the crane with the information given from the technical specifications sheet and a photo or basic design drawing of an existing crane. Starting from the basic layout of the crane, the structural design of the crane has to withstand weather conditions and the working loads given in the specifications. The finite element model is used to study the influences of the different loads and conditions of the crane.
For approval the crane has to be calculated according to the Dutch standards NEN 2018 and 2019. For this course at least the following criteria have to be checked:
• Material stress
• Fatigue
• Corner load
• Deflection
• Eigenfrequencies
• Buckling
• Dynamic behavior

The result of the course is a report with includes all calculations relevant to prove the structural integrity of the crane design.

Book: -

WB3417-04	Discrete Systems: MPSC	ECTS: 5

This is a course on the modeling of discrete systems for transport and production. It deals with a method to quickly design flexible prototype models and to implement them in a simulation environment. The method is based on the systems approach in combination with process-interaction modeling. Special attention is paid to the modeling of operational control and the use of these models for real-time control. A number of practical examples, including a production process, a transport system and a port will be considered.

During the course a number of individual assignments will be given to be answered via blackboard. Halfway the course, groups of 4 students are formed. Each group has to design(on paper) a process-interaction model of a realistic case including the model goal, performance indicators, input, output and an experimental design, resulting in a short report.

Those who have attained a satisfactory result for both the individual work and the group model design will be admitted to the second part of the course. This takes the form of a practical. The model developed in the first part has to be implemented and applied in a simulation environment based on Delphi and Tomas (see http://www.delphibasics.co.uk/ and www.tomasweb.com.

The results: process-interaction model design, implementation, experiments and final report will be graded.

Book: -

WB3419-03	Characterization and Handling of Bulk Solid Materials	ECTS: 6

This course focuses on the characterisation of the mechanical and dynamical behaviour of bulk solid materials. Bulk solid materials include coal, sand, limestone etc. These materials can be free flowing through bunkers and chutes as well as stored in silos, handled by stackers and reclaimers or transported by conveyors. Experimental ways to determine the mechanical properties of bulk solid materials will be discussed.

An experimental assignment to determine these properties of a particular bulk solid material is part of the course in the first period. With the experimentally determined properties the behaviour of this material in a silo (no flow or mass flow versus funnel flow) will be predicted.

Knowing the properties of a specific bulk solid material, the effect of these properties on the design of handling or transporting equipment can be determined. This includes also the influence from and on the environment of bulk handling systems.

Conceptually designing a piece of equipment for storing, handling or transporting a bulk solid material, of which the mechanical properties are determined experimentally earlier in this course, is also part of this course.

Book: Martin Rhodes, “Introduction to Particle Technology”, John Wiley & Sons, ISBN 0-471-98482-5, 2000.

WB3421-04	Automation and Control of Transport and Production Systems	ECTS: 6

This course focuses on the automation and control of modern transport and production systems. Automation is often necessary to increase the capacity or to reduce operating costs of industrial systems on one hand while maintaining a sufficient level of operational accuracy on the other hand. Automation requires full control of an industrial system and its equipment and a throughout understanding of the transport/manufacturing process and the dynamics of the equipment involved. In this course the automation of a number of typical systems will be studied and the dificulties and opportunities of new technologies. Basis of this course is a study of the dynamics of the operational process and the equipment. In an automated system data communication is important to ensure reliable performance. In this respect equipment and process monitoring is important as well. Therefore data acquisition, mining, analysis and transfer will be discussed in detail. The course is concluded by a practical assignment where the control of equipment used in an automated system will be studied.

Book: -

WB3422-03	Design of Transport Equipment	ECTS: 5

The course covers the application of design methodology to a specific case of conceptual design (functional analysis, morphological matrix, multicriteria analysis). Calculations of mechanical power for typical motion (cycle with start, stationary motion, stop), like in driving, hoisting, rolling and belt transport. Selection of driving motor and transmission. Soft start and controlled braking. Overview of typical equipment like cranes, stackers. Working cycle, working area, displacement functions (drive, slew, extend). Cable loop systems: examples and typical aspects like mechanical efficiency, wear and safety. Crane components like grabs and spreaders: typical aspects like open/close motions, force analysis, position accuracy. Application of kinematics and dynamics in transport equipment: transfer of non-uniform motion, degree of freedom, instantaneous center of rotation, kinematic transfer functions, transfer quality (pressure angle), force analysis using virtual work principle. Timed motion with start-stop behaviour. Static balancing regarding support forces and driving force. Dynamic effects like slip and rest vibration after a stop or a collision. Demonstration of tools for motion and force analysis. Dimensioning of the whole structure using standards (load

combination, group factor). Machine directives (CE-marking) and tender documents. Dimensioning of typical large stuctures such as lattices. Examples of welded connections. Demonstration of analysis tools for stress, deformation, fatigue.

Book: -

WI4051TU	Introduction to Operation Research	ECTS: 6

The student will be able to recognize, model and solve a problem as one of the types of linear optimization models. The course covers:

- History of Operations Research. Examples from practice.
- Linear Programming: LP Models, Simplex method, Sensitivity analysis, examples.
- Transport and assignment problems. Network optimization.
- Integer Programming: Computational complexity, examples, Branch-and-Bound procedure.
- Dynamical programming.

Book: Hillier&Lieberman: Introduction to operations research. 8th Edition McGraw-Hill ISBN 007-123828-X