

CT4870	Structural design of railway structures	4
Instructor	Lambert Houben	
Instructor	Coenraad Esveld	
Education Period	3rd Education Period	
Exam Period	3rd Exam Period	
Course Language	English	
Course Contents	<p>Principles of rail guidance Wheelset and track interaction, lateral movement of a wheelset on straight track, effective conicity, hunting movement, worn wheel profiles, optimum wheel profile design, risk of derailment, macro and micro geometry of track, adhesion, train resistance, track force diagram.</p> <p>Numerical analysis of track structure Track stiffness, numerical models of track: continuously and discretely supported beam on elastic foundation, two- and multi-layer track models, static and dynamic analyses of track structure, effects of incidental and periodical perturbations, dynamic numerical models vehicle-track interaction, analysis of switches.</p> <p>Temperature effects and stability of track Lateral resistance of track (elastic, plastic, bi-linear), analytical solutions, temperature effects in tracks on bridges, numerical models for estimation of track longitudinal forces, analytical approach for track stability analysis, critical values, situations in curves, computer-based models for track stability analysis.</p> <p>Rails Rail properties, wear, lubrication, wheel-rail contact mechanics, rail fracture mechanics, residual stresses in rails, stresses due to combined Q/Y load, production requirements, testing methods.</p> <p>Inspection methods Recording systems, wheel band defects, relevant wave bands, deterioration of track geometry, ultrasonic rail inspection, life cycle costs.</p> <p>Track building and maintenance methods Track maintenance and renewal, correction systems, maintenance of track components, safety aspects and train speed restrictions.</p> <p>Numerical models in railway engineering Introduction to numerical modelling, static analysis of track using MATLAB, dynamic analysis of track and train interaction using RAIL program, analysis of longitudinal forces in rails and track stability analysis using LONGSTAB software.</p> <p>Computer exercises Use of numerical models in railway engineering</p>	
Study Goals	Acquiring understanding of the functional and mechanical behaviour of railway structures under various loadings and conditions.	
Education Method	exercise lectures instruction	
Course Relations	CT4870 uses CT3041 CT4870 uses CT3711 CT4870 uses CT5871	
Literature and Study Materials	<p>obligatory lecturenote(s)/textbook(s): Book C. Esveld (2001) Modern Railway Track. Second Edition Available at the section secretariat.</p> <p>obligatory other materials: Handouts of the lectures via internet: www.rail.tudelft.nl</p>	

	Available at the website
Assessment	Oral exam
Remarks	Completing computer exercises (mark 6 or higher)
Judgement	Calculation: The final mark is based on the mark of the exercises (20%) and of the oral examination (80%)