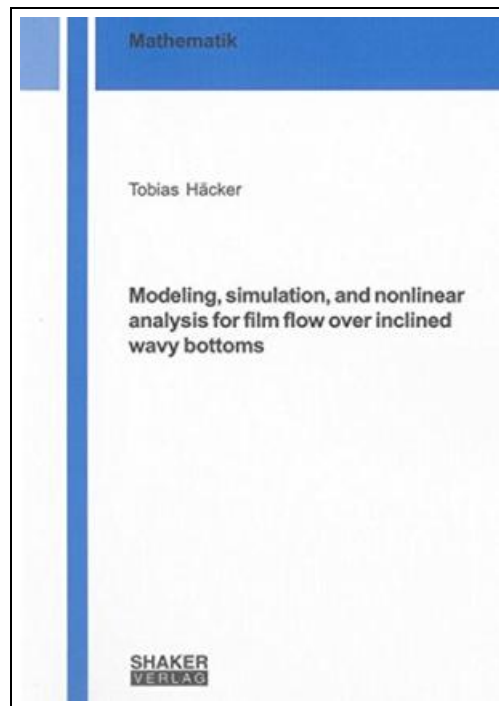


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Shaker Verlag Mrz 2010, 2010. Buch. Condition: Neu. Neuware - The gravity-driven free surface flow of a viscous liquid down an inclined plane has various engineering applications, for instance in cooling and coating processes. However, in many applications the bottom is not flat but has a wavy profile. This may be due to natural irregularities or by design, e.g., to increase the contact area in heat conductors. Thus, studying the stability of stationary solutions over wavy inclines is of great interest. If perturbations of the free surface decay to zero, we call the stationary solution stable, otherwise unstable. From linear analysis it is well known that stability is mainly determined by the dimensionless Reynolds number  $R$ , which is a measure for the ratio of inertial forces to viscous forces. More precisely, there exists a critical Reynolds number  $R_{crit}$  depending on the bottom waviness and the inclination angle such that the free surface becomes unstable for  $R > R_{crit}$ . In this thesis, we first derive model equations for the evolution of the film thickness  $F$  and the local flow rate  $Q$ . In case of a thin film over a weakly undulated bottom, we can introduce a small perturbation parameter which allows to solve the underlying Navier- Stokes equations by an asymptotic expansion approach. Using this solution as ansatz and test function in a Galerkin method for the downstream momentum equation, we obtain a system of parabolic partial differential equations for  $F$  and  $Q$ . According to the used methods, this is called weighted residual integral boundary layer (WRIBL) equation. 137 pp. Englisch.



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