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The dissertation is about a systematic treatment of coupled systems of differential-algebraic and partial differential equations. Whereas in systems theory, differential-algebraic control systems lead to descriptor systems and controlled partial differential equations lead to infinite dimensional ordinary systems, the coupling of both requires a theory about descriptor systems with an infinite dimensional state space.

Topics like solvability, decoupling, consistent initialization, perturbation analysis, Kalman controllability/observability decomposition are treated for infinite dimensional descriptor systems.

The theoretic results have been applied to a quite general class of delay-differential equations as well as for electrical circuits with transmission lines. Moreover, several practical interpretations of the analytic aspects are given by means of the circuit topology.