1014-70-1719 **Hiroaki Yoshimura*** (yoshimura@waseda.jp), Waseda University, 3-4-1, Okubo, Shinjuku, 169-8555 Tokyo, Japan, and **Jerrold E. Marsden** (marsden@cds.caltech.edu), Control and Dynamical Systems 107-81, Caltech, Pasadena, CA 91125-8100. *Dirac Structures, Variational Principles, and Implicit Lagrangian Systems.*

We develop a notion of implicit Lagrangian systems in the context of an induced Dirac structure D_{Δ_Q} on T^*Q. First, we illustrate that an induced Dirac structure can be defined from a distribution Δ_Q on a manifold Q and also that the Dirac differential $\mathfrak{D}L$ of a (possibly degenerate) Lagrangian L can be defined by employing the natural symplectomorphism $\gamma_Q : T^*TQ \to T^*T^*Q$ such that $\mathfrak{D}L = \gamma_Q \circ \mathbf{d}L$, which includes the generalized Legendre transform. Then, an implicit Lagrangian system (L, Δ_Q, X) is defined associated to a vector filed X on T^*Q and the induced Dirac structure D_{Δ_Q} such that $(X, \mathfrak{D}L) \in D_{\Delta_Q}$. We also demonstrate variational structures by a generalized variational principle called the Hamilton-Pontryagin principle, and it provides implicit Euler-Lagrange equations, which are equivalent to the standard implicit Lagrangian system, i.e., the case that $\Delta_Q = TQ$. Last, we show illustrative examples of nonholonomic constrained systems, as well as an L-C circuit that is a typical degenerate Lagrangian system with holonomic constraints, can be represented in the context of implicit Lagrangian systems. (Received September 29, 2005)