INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.
Thesis Title	:	**Inverse engineering in quantum and classical systems via shortcut to adiabaticity**
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SHORT ABSTRACT

Shortcut to adiabatic passage methods, developed to circumvent the shortcomings of the usual adiabatic passage methods in quantum optics, now finds immense applications in diverse areas of physics. It finds its applications in quantum information science, Bose-Einstein condensates, Ultra-cold atoms, non-Hermitian systems and even in waveguide optics and biological systems. In this thesis, we have applied the so-called transitionless quantum driving (TQD) and Lewis-Riesenfeld Invariant (LRI) shortcut methods to a variety of classical and quantum systems to enhance the efficiency and fastness of certain processes related to the system. We have proposed a variety of schemes and protocols in this regard. For example, we show how it is possible to prepare an entangled state in extremely short time without losing robustness and efficiency; how to achieve high fidelity power switching in a waveguide coupler at an arbitrarily short length, attainment of fast soliton compression in a nonlinear waveguide, wireless power transfer between two coils and so on.