Abstract: Spin-based electronics, or the so-called spintronics, is a research field whose aim is to use magnetic materials and the electron’s spin to store, manipulate, and carry information in electronic devices. Spintronics offers very appealing and promising solutions to the rapidly growing computer and information technologies, which are in a constant need of denser data storage capabilities, faster and more efficient means to control and process data. In this seminar, we will review the most recent advances regarding electrical detection and manipulation of magnetic states in spintronic devices. We will focus on the spin-dependent electrical transport effects in ferromagnetic heterostructures with strong spin-orbit coupling, which give rise to an array of highly intriguing phenomena, such as spin-orbit torques [1], unusual magneto-resistive behaviors [2], and current-induced switching/domain wall motion [3]. We will conclude by commenting on the future challenges and potential directions in all-electrical control of magnetization.