Hyperelliptic Curve Cryptosystems (HCCs) is a generalization of Elliptic Curve Cryptosystems (ECCs) and have been of recent interest to cryptographic researchers. To achieve the same level of security, HCCs use smaller field than ECCs. HCC has a more potential application to the product that has limited memory and computing power, for instance smart cards. In this sense, our purpose in this project is firstly define HCC and its mathematical background, compare it with ECC in terms of advantages and disadvantages. Then we plan to mention about some performance and efficiency measures of HCC in some implementation areas. Lastly, we will talk about cryptanalytic algorithms for their attack.