Matrix Analysis and its applications are an important area of Applied Mathematics and are the basis of many industrial applications and for engineering in general. This work can be classified as being part of Matrix Analysis. Some partial orders and pre-orders defined in terms of generalized inverses on different sets of complex matrices are studied. In the first part of this thesis the star partial order on the class of EP matrices is studied. In this work some results obtained by Merikoski and Liu are extended to the class of EP matrices. Successors and predecessors of an EP matrix are characterized, and necessary and sufficient conditions are established for they to belong to the same class. New demonstrations of some known results using the canonical form of the EP matrices are presented. In this way a result which provides decompositions for two EP matrices comparable by the star partial order, is obtained and proved. N. Castro-González, J. Vélez-Cerrada, D. S. Djordjevic, J. J. Koliha, and Y. Wei are some authors who studied spectral projectors, denoted by $A^\pi$, corresponding to the eigenvalue zero of a matrix A. For a fixed matrix A, they characterized all matrices for which their spectral projectors coincides with $A^\pi$. In this work, we restrict our attention to the class of EP matrices and spectral projectors corresponding to the eigenvalue zero are characterized. Furthermore, the projectors mentioned above are linked to star and group partial orders. The Moore-Penrose inverse appears when the approximate (in norm 2) least squares solution of an inconsistent system of linear equations is found. When norms induced by Hermitian and positive definite matrices are employed,
it is necessary to use the weighted Moore-Penrose inverse. This inverse has been studied by several authors such as Y. Wei, G. Wang, S. Qiao, H. Wu. among others. In many real situations, the problem to solve is modeled by matrices having a particular structure as, for example, they are symmetric, Hermitian, normal, EP, tridiagonal, etc. In this document, the class of EP(M;N) matrices is considered, that is, EP matrices weighted with respect to two Hermitian and positive definite matrices M and N, and in that set the weighted star partial order with respect to M and N is defined. First, the square matrices that belong to this class are studied and analyzed and then for the case M = N details are provided characterizing predecessors and successors of an EP(M;M) matrix. Extending the results given by N. Matzakos y D. Pappas for weighted EP matrices, two algorithms are designed to calculate the weighted Moore-Penrose inverse of a EP(M;M) matrix. The Drazin inverse is another generalized inverse considered in this memory. A nonzero weight matrix W is considered to transform a rectangular matrix A into two square matrices, AW and WA. Then, three new pre-orders on the set of rectangular complex matrices are defined. Matrices related by these pre-orders are characterized, finding in each case a representation for them. In particular, adjacent matrices are characterized. It is also studied the class of matrices with equal weighted Drazin projectors and they are related to the new pre-order.