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SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

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Invariant subspaces for classes of operators: finite rank perturbations of normal operators and positive operators **(Prelectura de Tesis doctoral)**

The Invariant Subspace Problem is, probably, one of the most important open problems in Operator Theory on Hilbert spaces. One of the most successful approaches that have been considered to obtain results for such a problem consists in studying particular classes of operators and taking advantage of their properties. This strategy has provided results for certain cases, although nowadays there are plenty of apparently simple classes of operators for which the existence of non-trivial closed invariant subspaces is still unknown.

In this thesis, we study this problem for two classes of operators: finite rank perturbations of normal operators acting on Hilbert spaces and positive operators acting on Banach lattices.

For finite rank perturbations of normal operators, we characterize some spectral properties such as the single-valued extension property, as well as the spectral subspaces associated to closed sets of the complex plane. As a consequence, we obtain results about the existence of non-trivial hyperinvariant subspaces for such operators, which improve considerably the previous results by Foia, Jung, Ko and Percy and Fang and Xia. We also show that such hyperinvariant subspaces are indeed images of idempotents lying in the bicommutant of the operator, which allows us to deduce the decomposibility for a subclass of this operators. Finally, we characterize the existence of non-trivial reducing subspaces in various situations, in which the spectral picture plays a fundamental role.

On the other hand, we show that every lattice homomorphism acting on a Banach lattice whose order is induced by an unconditional basis has non-trivial closed invariant subspaces, indeed non-trivial closed invariant ideals. Moreover, we study positive band-diagonal operators acting on such spaces, for which we obtain characterizations of existence of non-trivial closed invariant ideals and a generalization of a theorem of Grivaux for positive tridiagonal operators.

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