Title: Microscopic nuclear models for open-shell nuclei

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Abstract: Since the nucleus is a quantum many-body system consisting of constituents whose mutual interaction is not satisfactorily known, it is necessary to use approximate methods when describing the nucleus. Basic approximate approaches in the microscopic theory of the nucleus are the Hartree-Fock theory, Tamm-Dancoff approximation and random phase approximation. They are described in the first chapter of this thesis. The main aim was to develop microscopic models for open-shell nuclei with two valence particles or holes. They are described in the second chapter, which contains detailed derivations of the relevant formulae. These methods have been numerically implemented. The results of the calculations of the nuclear spectra and the electromagnetic transition probabilities are presented in the third chapter.