Density functional theory is a preferred microscopic method for calculation of nuclear properties over the whole nuclear chart. Besides ground-state properties, which are calculated by Hartree-Fock theory, nuclear excitations can be described by means of Random Phase Approximation (RPA). The main objective of the present work is to give the RPA formalism for spherically symmetric nuclei, using the techniques of angular-momentum coupling. Various auxiliary topics, such as Hartree-Fock theory, Coulomb integral, center-of-mass corrections and pairing, are treated as well. RPA method is derived also for axially deformed nuclei. The derived formulae are then implemented in the computer code and utilized for calculation of some physical results. After thorough investigation of the precision aspects of the calculation, the following topics are treated as examples: toroidal nature of the low-energy (pygmy) part of the E1 resonance, giant resonances of various multipolarities in deformed nucleus 154Sm, and magnetic dipole (M1) transitions in deformed 50Cr.