

به نام خدا

سمینارهای گروه گرانش و کیهان‌شناسی

دکتر سعدالله نصیری

دانشکده فیزیک، دانشگاه شهید بهشتی

موضوع

## Quantum Mechanics in Phase Space and Applications

چکیده

The Hamiltonian formalism of classical dynamics treats the coordinates,  $q$ , and momenta,  $p$ , on an equal basis. When it comes to quantization procedure, however, one either chooses a coordinate or momentum representation and ends up with state functions either in  $q$  or in  $p$  space. The equal status of  $q$  and  $p$  is lost. We propose a quantization procedure to begin with a higher level of abstraction, in which the independence and the symmetric role of  $q$  and  $p$  is maintained throughout, and at once arrive at phase space state functions. Upon reduction to the  $q$ - or  $p$ -space the conventional quantum mechanics emerges as special case of this formalism, however, with a definite rule for ordering of factors of non commuting observables. The classical statistical mechanics and the von Neumann's density matrix theory of quantum many body systems may be inferred from it. Wigner's functions and their evolution equation may also be obtained by a unitary transformation. Further conceptual and practical merits of the formalism are demonstrated by applying it to the problems of many body systems.

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تالار ابن هیثم، دانشکده فیزیک، دانشگاه شهید بهشتی