The application of amorphous and nanocrystalline layers on metal substrates is an important method to improve surface performance of engineering parts. In this work, a new composition of Fe-١٥Cr-٤Mo-٥P-٤B-١C-١Si (wt.%) amorphous powder was produced by mechanical alloying (MA) of elemental powder mixtures and then thermal spraying of this powder was done by high velocity oxy fuel (HVOF) technique at various spraying condition to obtain the desirable amorphous and nanocrystalline structures. The microstructure, thermal properties, and wear resistance of Fe-based amorphous-nanocrystalline powder particles as well as HVOF coatings were investigated by X-ray diffractometry (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and differential scanning calorimetry (DSC). The results suggest that one exothermic peak was observed on DSC traces, implying that the crystallization process undergoes only one stage. It was found that the amorphization starts at the edge of particles and progress into the internal regions as MA proceeds. Increasing milling time to ٨٠ h yielded a fully amorphous structure. Thermal spray coatings show that by adjusting the HVOF parameters especially fuel/oxygen ratio and proper selection of powder composition, the desired microstructure with different amount of amorphous and nanocrystalline phases and therefore with different wear properties could be obtained. Wear test showed that amorphous coatings have lowest friction coefficient (٠,١٨) in comparison with crystalline coatings.