- Derivation of a reduced order representation of detailed numerical models, i.e., a metamodel, of increased computational efficiency.

- Simulation of nonlinear response for the case of dynamic excitation through the use of a Nonlinear AutoRegressive with eXogenous input (NARX) model.

- Incorporation of uncertainty of the model parameters into the simulation, through expansion on an appropriate Polynomial Chaos (PC) basis.

- A new metamodeling approach, termed the PC-NARX method is therefore introduced.

- Apart from the structural parameters, the input excitation assumed to be earthquake ground motion is additionally parameterized and considered as one of the uncertain inputs of the model.

- A vast reduction in computational time is achieved with sufficient accuracy, yielding a methodology that is highly appropriate for implementations where replacement of refined and computationally costly models is sought (inverse problems, Monte Carlo simulations)