

**TRAINING COURSE
“CIVIL STRUCTURES ANALYSIS & REQUIREMENTS”**

DRAFT CARD

Course Objective: Provide formation on safety design criteria and safety requirements with introduction to applicable codes for safety review of civil structures of NPP and other NF.	
Duration: from two weeks to 2 months	
CONTENT	
Introduction to Nuclear Power Plants and NF	Short description of current available technology and their basic conception
Civil Structures in NPP	Main structures and buildings, including containment building, functions and requirements
Safety design requirements	Safety objectives and design criteria and requirements. Safety classification. Structural performance targets
Structural analysis criteria	Development of finite element models, commercial and public domain computer codes
Seismic Design (various phases)	Seismic hazard and evaluation of design events
	Soil amplification, treatment of uncertainties in soil properties
	Static and Dynamic analysis, simplified models, Soil-Structure interaction and related computer codes
	Application on nonlinear analysis in NPP structural design, BDB events evaluation.
Aircraft impact and Ext. pressure wave	Evaluation of design loads and analysis techniques, simplified models
Other external natural loads (tornadoes,... etc.)	Tornado missiles, perforation criteria
In-structure and floor response spectra	Evaluation of floor response spectra, treatment of uncertainty
Interaction between civil structure and mechanical components	Dynamic Analysis of multiple support structures and piping design
Specific problems of NPP structural design and construction	Large reinforced concrete structures, heat development after pouring, shrinkage, bar splicing ...
Design Evaluation	Techniques for independent quick review of key aspects in structural design
Regulatory expert review	Expert Review of the safety analyses of seismic design and aircraft crash of a reactor building. Application(s) of FEM in selected problems
Supervision during construction of civil structures	Guidelines for civil works inspection. Verification of executive design with the licensed design. Inspection organization. Required competences. Sampling and testing for concrete and steel reinforcement. Onsite organization and quality management.