

# GULF INSTITUTE



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# Advanced Analysis and Design of Reinforced Concrete using ACI Code

## INTRODUCTION

- There is a need to focus on understanding the design of special reinforced concrete structures and pre-stressed concrete. Those main items of reinforced concrete structures are widely used in industrial sector, especially in the onshore oil and gas fields.
- This training course will lead the delegates to the professionalism in the design of reinforced concrete for industrial projects generally, and specifically for oil & gas projects.
- ACI code will be the only guide to enable the participants focus on suitable design method to serve business safety and operability.

### This training course will feature:

- The advanced models of simulating reinforced concrete systems
- The advanced models of design the slabs and beams
- The importance of earthquake analysis
- The design of special structures
- The advanced techniques to decrease thicknesses of reinforced concrete such as pre-stressed concrete and post-tension slabs

## OBJECTIVES

- This training seminar aims to provide those involved in the base course with the understanding and practical capabilities needed to design the slabs and beams with advanced techniques in addition to develop the abilities to design special structures, uncracked structures and prestressed concrete. The specific objectives are as follows:
- To teach delegates how to solve a wide range of special problems which require modelling and simulation analytical approaches of reinforced concrete beams and slabs
- To provide advanced models to simulate reinforced concrete systems using workshops
- To teach delegates the methods of keeping structures in safe conditions against earthquake forces
- To teach delegates the serviceability of uncracked sections in designing special structures
- To teach delegates to control thicknesses of concrete and saving reinforced steel percentage by using prestressed concrete and posttension slabs

## TRAINING METHODOLOGY

- This Advanced Analysis and Design of Reinforced Concrete using ACI Code training seminar will utilise a variety of proven adult learning techniques to ensure maximum understanding, comprehension and retention of the information presented. The daily workshops will be highly interactive and participative. Videos and photos will be used for illustration.
- This training seminar, distributes the time spent on the theory and mathematics of analysis from a side and the use of practical methods and workshops from another side, along with the understanding of how and why such methods work.

## ORGANISATIONAL IMPACT

- Decrease the cost of engineering by improving the capabilities of delegates to self-design
- Optimizing the sections of concrete and steel ratio by improving the skills of attendees to perform a well reviewing in addition to advanced techniques of solving the problems
- Increase the skills of design of organization which will be optimized to achieve projects in the right time

## PERSONAL IMPACT

- Participants will each gain extensive understanding and lots of practical experience of a wide range of the more common modelling, simulation and predictive analytical techniques, all of which will have direct relevance to a wide range of special challenges; specifically, delegates will acquire:
  - An understanding of analysis and design special structures
  - Knowledge of controlling the serviceability of uncracked sections
  - Sufficient situational knowledge when a technique will lead to incorrect conclusions
  - The ability to recognize which types of analysis are relevant to particular types of issues

## WHO SHOULD ATTEND?

- This Advanced Analysis and Design of Reinforced Concrete using ACI Code training course has been designed for professionals whose jobs involve the design of special structures, pre-stressed or posttension in addition to uncracked sections. This training seminar involves extensive modelling and analysis and therefore delegates must enjoy detailed working analysis and design calculation to solve complex problems.
- This training course will also be beneficial for senior level civil and structure engineers who have already who needs to have in-depth skills about the structural engineering activities and how to co-operate in the design phase.

## Course Outline

### Advanced Design of Reinforced Concrete Slabs and Beams

- Strip Method
- Yield Line Method
- Shear Friction
- Horizontal Shear Transfer and Composite Concrete Beams
- Design of Shear Walls
- Strut -and- Tie Model
- Truss Model
- Deep Beams
- Bearing & Shear Walls
- Corbels

### Design for Earthquake Resistance

- Effect of Confining and Introducing Famous Models
- Flexural Hinges and their Lengths
- Ultimate Deformation and Ductility of Members with Flexure
- Moment-curvature Relationships
- Cyclic Behavior of Beam-Column Member
- Redistribution of Moments in Reinforced Concrete Beams
- Design of Beam-Column Joints

### Unified Analysis of Reinforced Concrete Structures

- Strut -and- Tie Model
- Equilibrium (plasticity) Truss Model
- Bernoulli Computability Truss Model
- Mohr Computability Truss Model
- Softened Truss Model
- Structural Modeling of RC Systems
- Deformation of Uncracked Sections (creep & shrinkage and temperature)

### Design of Special Structures

- Arches
- Special Types of Frames and Trusses
- Folded Plate Roofs
- Arched Slab Systems
- Silos
- Cooling Towers

## Design of Pre-stressed Concrete

- Pre-tensioning and Post-tensioning
- Materials Used for Prestressed Concrete
- Stress Calculations
- Shapes of Prestressed Sections
- Prestress Losses
- Ultimate Strength of Prestressed Sections
- Deflections
- Design of Shear Reinforcement

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