Advanced Analysis and Design of Reinforced Concrete Using ACI Code Training Course

Professional Development Training Course Outline

Category	Construction Institute	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Advanced Analysis and Design of Reinforced Concrete Using ACI Code Training Course is a comprehensive program for **structural engineers** and **civil engineers** seeking to master advanced concepts in concrete design. The course goes beyond fundamental principles to address complex structural systems, modern materials, and sophisticated analysis techniques. It's built around the **American Concrete Institute (ACI)** code, the industry standard for safe, efficient, and durable concrete structures.

This training equips professionals with the expertise to tackle challenges in today's **high-performance construction** projects, including seismic design, sustainable practices, and the use of **high-strength concrete**. Participants will gain the confidence to apply **cutting-edge methodologies** and **software tools**, ensuring their designs are both innovative and compliant with the latest industry regulations. The curriculum is designed to foster a deep, practical understanding, enabling engineers to deliver robust, **cost-effective solutions** that meet the stringent demands of modern infrastructure.

Programme Curriculum

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Course Objectives

1. Master the latest ACI 318-19 building code for reinforced concrete design.
2. Analyze complex structural systems including shear walls and two-way slabs.
3. Evaluate seismic design principles and their application in concrete structures.
4. Implement advanced finite element analysis (FEA) for non-linear behavior.
5. Design high-performance concrete (HPC) and sustainable concrete mixes.
6. Apply strut-and-tie modeling for regions of discontinuity and deep beams.
7. Optimize structural elements for cost-effective and constructible solutions.
8. Assess serviceability for deflection, crack control, and durability.
9. Conduct seismic retrofitting and rehabilitation of existing concrete structures.
10. Utilize advanced structural analysis software like ETABS and SAP2000.
11. Perform comprehensive load path analysis for complex geometries.
12. Integrate sustainability and green building principles into design.
13. Manage risk and ensure structural integrity in complex projects.

Target Audience

1. Civil and Structural Engineers seeking to specialize in advanced concrete design.
2. Senior Project Engineers overseeing complex concrete projects.
3. Construction Managers needing a deeper understanding of design requirements.
4. Architects involved in the design and construction of concrete buildings.
5. Engineering Consultants providing design and analysis services.
6. Graduate Students and academics in structural engineering.
7. Forensic Engineers investigating concrete structure failures.
8. Government and Public Works Professionals responsible for infrastructure.

Course Outline

Module 1: Fundamental Principles & Advanced ACI Code Application

- Review of **ACI 318-19** and its historical evolution.
- Understanding of **limit state design** vs. allowable stress design.
- Load combinations and strength reduction factors per ACI.
- Material properties and specifications for **high-strength concrete (HSC)**.
- Case Study: Analyzing a multi-story parking garage design using the latest ACI code provisions.

Module 2: Advanced Flexure, Shear, and Torsion

- Design of slender beams and moment redistribution in continuous members.
- **Advanced shear design** including deep beams and corbels.

- Torsion analysis and design for combined bending and shear.
- Introduction to **non-linear analysis** for material and geometric non-linearities.
- Case Study: Designing complex curved beams for a modern stadium.

Module 3: Slender Columns and Shear Walls

- **P-delta effects** and moment magnification for slender columns.
- **Biaxial bending** analysis and design using interaction diagrams.
- Design and detailing of **shear walls** for lateral force resistance.
- Boundary element design for seismic resistance in shear walls.
- Case Study: Designing a high-rise core wall system for a skyscraper.

Module 4: Two-Way Slab Systems and Foundations

- **Direct Design Method (DDM)** and **Equivalent Frame Method (EFM)** for two-way slabs.
- Shear and moment transfer at slab-column connections (punching shear).
- Design of concrete footings and mat foundations.
- Detailed reinforcement layout and detailing for crack control.
- Case Study: Analyzing a flat-plate office building using ACI's Equivalent Frame Method.

Module 5: Seismic Analysis and Design

- Introduction to **earthquake engineering** and structural dynamics.
- Seismic detailing for **ductility** in beams, columns, and joints.
- Capacity design principles to ensure ductile failure mechanisms.
- Design of **seismic force-resisting systems** per ACI 318.
- Case Study: Applying seismic design principles to a hospital structure in an active seismic zone.

Module 6: Strut-and-Tie Modeling (STM)

- Principles of **strut-and-tie modeling** for D-regions (disturbed regions).
- Application of STM to corbels, deep beams, and pile caps.
- Verification and detailing of struts, ties, and nodal zones.
- Integrating STM with traditional analysis methods.
- Case Study: Designing a large-scale corbel for a bridge pier using STM.

Module 7: Advanced Materials & Sustainability

- Properties and applications of **high-performance concrete (HPC)**.
- **Fiber-reinforced concrete (FRC)** and its use in structural applications.
- Sustainable concrete design with supplementary cementitious materials (SCMs).
- **Corrosion protection** and durability design for aggressive environments.
- Case Study: Designing a bridge deck using sustainable, high-durability concrete.

Module 8: Software Application & Project-Based Learning

- Hands-on training with **ETABS and SAP2000** for advanced modeling.
- Creating a complete **building information model (BIM)** for a reinforced concrete structure.
- Performing non-linear static (pushover) and dynamic (time-history) analysis.
- Automated design and code-checking features for ACI compliance.
- Case Study: A final project involving the complete analysis and design of a multi-story building.

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

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