



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code : DI05006041

Subject Name : Construction Quality Control & Monitoring

w. e. f. Academic Year:	2026-27
Semester:	5th
Category of the Course:	PEC-03

Prerequisite:	Students must possess a foundational understanding of civil engineering materials and their properties as per the relevant Indian Standard (IS) codes.
Rationale:	Construction Quality is designed to provide civil engineering students with essential knowledge and practical skills to ensure quality in construction projects. It covers fundamental concepts such as quality assurance, quality control, and total quality management, helping students understand systematic approaches to maintaining standards. The course emphasizes practical aspects like material testing, site inspections, and quality checks in building construction, bridging the gap between theory and field practice. It also introduces basic statistical tools and risk-based approaches to improve decision-making and prevent defects. Familiarity with BIS codes, NBC guidelines, and ISO standards ensures students understand regulatory and industry requirements. Additionally, the syllabus incorporates modern trends such as sustainable construction, green building concepts, and digital tools like BIM and drone inspections. Overall, the course prepares students to become competent, responsible, and industry-ready professionals capable of delivering safe, efficient, and high-quality construction work.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	outline principles of Quality Assurance, Quality Control, Cost of Quality, and construction quality documentation.	R,U
02	prepare Inspection Test Plans (ITP), Non -Conformance Report (NCR)s, and site quality checklists.	R,U,A
03	conduct material tests and implement quality control procedures for building works.	R,U,A
04	use basic statistical tools such as control charts and root cause analysis.	R,U,A



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05	apply IS 456:2000 for concrete, IS 1786 for steel, IS 2720 for soil testing, and IS 800:2007 for steel structures, ISO 9001; 2015 practices, and green building guidelines in construction.	R,U,A
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*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Fundamentals of Construction Quality	7	15
2.	Practical Quality Control in Building Construction	12	26
3.	Statistical & Risk-Based Quality Control	10	23
4.	Codes & Quality Management Systems	8	18
5.	Sustainable & Digital Construction Quality	8	18
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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1	Fundamentals of Construction Quality	<ol style="list-style-type: none"> 1.1 Meaning of Quality in Construction 1.2 Importance of quality 1.3 Difference between Quality Assurance and Quality Control. 1.4 Total Quality Management (TQM) 1.5 Elements of quality – Quality assurance techniques (inspection, testing, sampling) 1.6 Cost of Quality (Prevention, Appraisal, Internal & External Failure) 1.7 Inspection Test Plan (ITP), Non -Conformance Report (NCR), Method Statements, Checklists 1.8 PDCA Cycle and Kaizen cycle 1.9 Ethics in Inspection and Reporting 1.10 Case Studies and Best Practices Analyzing <ul style="list-style-type: none"> • Successful TQM implementations in construction • Learning from real-world examples and best practices.
2	Practical Quality Control in Building Construction	<ol style="list-style-type: none"> 2.1 Material Testing: Cement, Aggregates, Steel, Concrete 2.2 Sampling methods 2.3 Reinforcement inspection and cover checking 2.4 Concrete placement and curing quality control 2.5 Masonry and plastering quality checks 2.6 Waterproofing inspection 2.7 Finishing works quality control 2.8 Daily quality report format 2.9 Use of MS Excel for QC records 2.10 Introduction to BIM in quality monitoring
3	Statistical & Risk-Based Quality Control	<ol style="list-style-type: none"> 3.1 Need for Statistical Quality Control 3.2 Types of data (Variable & Attribute) 3.3 Control Charts: p-chart, c-chart, X-bar chart, R-chart 3.4 Acceptance Sampling concept 3.5 Root Cause Analysis (5 Why, Fishbone Diagram) 3.6 Basic concept of Risk in construction 3.7 Introduction to Failure mode and effective analysis (FMEA) 3.8 Preparation of simple risk register
4	Codes & Quality Management Systems	<ol style="list-style-type: none"> 4.1 Role of Bureau of Indian Standards (BIS) 4.2 Application of IS Codes in site inspection 4.3 Overview of National Building Code (NBC 2016)



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		<p>Part 0 to 12</p> <p>(a) Objectives</p> <p>(b) Basic Content of each part</p> <p>(c) Application</p> <p>4.4 Study of ISO 9001 – Quality Management System</p> <p>4.5 Study of ISO 45001 – Occupational Health & Safety</p> <p>4.6 Study of ISO 14001 – Environmental Management (Overview)</p> <p>4.7 Study of ISO 50001- Energy management system</p>
5.	Sustainable & Digital Construction Quality	<p>5.1 Sustainable buildings & construction</p> <p>5.2 Definition – Green Building, Green Construction, Objectives of Green building</p> <p>5.3 Green building case studies</p> <p>5.4 GRIHA and LEED overview</p> <p>5.5 Net-zero building concept</p> <p>5.6 Carbon footprint in construction</p> <p>5.7 Life cycle assessment (LCA)</p> <p>5.8 Digital inspection using drones</p> <p>5.9 Waste reduction, Reusing and Repurposing Materials</p> <p>5.10 Lean construction basics</p> <p>5.11 Energy conservation building code (ECBC-2007)</p> <p>5.12 National Mission on Sustainable Habitat (NMSH)</p> <p>5.13 5S concept</p> <p>5.14 Initiatives in promoting C & D waste products by Government of India.</p> <p>5.15 Introduction to Guidelines on Environmental Management of C&D Wastes</p>

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publisher
1	Construction Project Management: Planning, Scheduling and Controlling	K.K. Chitkara	Tata McGraw Hill
2	Construction Management	K.K. Chitkara	Tata McGraw Hill



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3	Quality Management in Construction Projects	K.K. Chitkara	McGraw Hill
4	Construction Management and Quality Control	S.K. Sharma	S. Chand
5	Project Planning and Control with PERT and CPM	B.C. Punmia & K.K. Khandelwal	Laxmi Publications
6	Juran's Quality Handbook	J.M. Juran & A.B. Godfrey	McGraw Hill
7	Quality Control	Dale H. Besterfield	Pearson
8	Guide to Quality Control	Kaoru Ishikawa	Asian Productivity Organization
9	National building code, IS09000/14000 and other standards.		
10	BIM Handbook	Eastman, Teicholz, Sacks, Liston	Wiley

(b) Open source software and website:

Sr. No.	Category	Name of Software / Website	Application
1	Open Source Software	LibreOffice Calc	Preparation of quality control reports, data recording and analysis
2	Open Source Software	QGIS	Site mapping, spatial analysis and planning
3	Open Source Software	FreeCAD	Basic BIM modeling and construction visualization
4	Open Source Software	BlenderBIM	Open-source BIM for quality monitoring and coordination
5	Open Source Software	R Software	Statistical quality control and data analysis
6	Open Source Software	OpenDroneMap	Drone-based site inspection and mapping
7	Open Source Software	Scilab	Engineering calculations and statistical applications
8	Learning Website	Bureau of Indian Standards (BIS)	Access to IS codes and standards
9	Learning Website	National Building Code (NBC)	Building rules and construction guidelines



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10	Learning Website	CPWD	Standard specifications and quality practices
11	Learning Website	NPTEL	Online courses on construction and quality management
12	Learning Website	SWAYAM	Government e-learning platform

Suggested Course Practical List:

Exp No.	List of practicals	Hours	Unit No.
1	Prepare & Perform Power Point Presentation highlighting key features of TQM, demonstrate PDCA cycle through a simple case	04	1
2	<ul style="list-style-type: none">Conduct site visit and Prepare cement register, steel register, concrete consumption register, curing register, hindrance register, cube casting/testing register, aggregate register.conduct reinforcement inspection and cover checkingobserve and record concrete placement and curing practicesprepare checklists for masonry, plastering and waterproofingprepare daily QC report using spreadsheet software	12	2
3	Collect sample data and plot control charts (X-bar / p-chart); perform root cause analysis using Fishbone diagram or 5 Why method; prepare a simple risk register for construction activity	06	3
4	Study and summarize key provisions of relevant IS codes (e.g., IS 456); review NBC guidelines; prepare a brief report on ISO 9001 quality management practices	04	4
5	Study green building concepts (GRIHA/LEED); observe or demonstrate BIM model for quality monitoring; explore drone-based inspection methods; implement 5S principles through case study or site observation	04	5

List of Laboratory/Learning Resources Required:

Suggested Project List:

Suggested Activities for Students:

- Prepare a case study on quality issues observed in a nearby construction site and suggest corrective measures.



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- Collect and study real-life samples of QA/QC documents such as ITP, checklists, and NCR formats from industry.
- Visit a construction site and identify quality control practices followed for concrete, masonry, and finishing works.
- Develop a simple Excel-based format for daily quality reporting and data tracking.
- Watch and summarize technical videos related to drone-based inspection in construction.
- Perform a small group activity to implement 5S principles in classroom or lab environment.

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