



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MATERIAL TESTING LABORATORY								
III Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEE08	Core	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes: 36			
Prerequisite: Nil								

I. COURSE OVERVIEW:

Material testing laboratory introduces students to the essential testing procedures for evaluating the quality and performance of cement, aggregates, fresh concrete, and hardened concrete. Through hands-on experiments aligned with IS codes, students gain practical knowledge of material properties, workability, strength, and durability assessments. The course also familiarizes students with non-destructive testing techniques, enabling them to assess in-situ concrete without damaging structures. This lab bridges theoretical concepts with field practices, preparing students for real-world construction quality control and material evaluation.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. The physical characteristics and standard testing methods for cement and aggregates as per IS codes to ensure their suitability in concrete production.
- II. The procedures to evaluate workability and strength properties of fresh and hardened concrete using appropriate laboratory tests.
- III. The basic techniques of non-destructive testing to assess the in-place quality and durability of concrete structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- CO 1 Determine the fineness and standard consistency of cement to verify suitability of cement for concrete mixes as per IS code standards.
- CO 2 Measure the initial and final setting time of cement to evaluate its workability window and suitability for site conditions.
- CO 3 Evaluate the physical properties of aggregates such as specific gravity, grading, and bulking to ensure proper selection and batching of materials.
- CO 4 Conduct workability tests on fresh concrete using slump cone and compacting factor methods to assess consistency for placement and compaction.
- CO 5 Test the compressive and tensile strength of hardened concrete specimens to confirm strength development as per design requirements.
- CO 6 Perform non-destructive tests on concrete using rebound hammer to assess surface hardness and uniformity without damaging the structure.

IV. COURSE CONTENT:

EXERCISE – I: FINENESS OF CEMENT

Determination of the fineness of cement using 90-micron sieve as per IS:4031 (Part 1).

EXERCISE – II: STANDARD CONSISTENCY OF CEMENT

Determination of standard consistency of cement using Vicat apparatus as per IS:4031 (Part 4).

EXERCISE – III: INITIAL AND FINAL SETTING TIME OF CEMENT

Measurement of initial and final setting time of cement as per IS:4031 (Part 5).

EXERCISE – IV: COMPRESSIVE STRENGTH OF CEMENT

Determination of compressive strength of cement mortar cubes as per IS:4031 (Part 6).

EXERCISE – V: SOUNDNESS OF CEMENT

Assessment of the soundness of cement using Le-Chatelier apparatus as per IS:4031 (Part 3).

EXERCISE – VI: SPECIFIC GRAVITY OF CEMENT

Determination of specific gravity of cement using Le-Chatelier flask as per IS:4031 (Part 11).

EXERCISE – VII: SPECIFIC GRAVITY OF FINE AGGREGATE

Determination of specific gravity of fine aggregate using pycnometer as per IS:2386 (Part 3).

EXERCISE – VIII: GRADING OF AGGREGATES (FINENESS MODULUS)

Grading and fineness modulus of fine and coarse aggregates using sieve analysis as per IS:2386 (Part 1).

EXERCISE – IX: BULKING OF FINE AGGREGATE

Determination of bulking of sand due to moisture content as per IS:2386 (Part 3).

EXERCISE – X: SLUMP CONE TEST FOR FRESH CONCRETE

Measurement of workability of fresh concrete using slump cone test as per IS:1199.

EXERCISE – XI: COMPACTING FACTOR TEST

Evaluation of workability of fresh concrete using compacting factor apparatus as per IS:1199.

EXERCISE – XII: COMPRESSIVE STRENGTH TEST ON CONCRETE CUBES

Testing of hardened concrete cubes for compressive strength as per IS:516.

EXERCISE – XIII: SPLIT TENSILE STRENGTH TEST ON CONCRETE

Conducting split tensile strength test on concrete cylinders as per IS:5816.

EXERCISE – XIV: REBOUND HAMMER TEST (NON-DESTRUCTIVE TESTING)

Performing rebound hammer test on hardened concrete surface as per IS:13311 (Part 2)

V. TEXTBOOKS:

1. Shetty, M. S. “*Concrete Technology: Theory and Practice*”, Revised Edition, S. Chand Publishing, 2019.
2. Gambhir, M. L. “*Concrete Technology*”, McGraw Hill Education (India) Pvt. Ltd., 5th Edition, 2013.
3. Neville, A. M., and J. J. Brooks. *Concrete Technology*, Pearson Education Limited, 2nd Edition, 2010.

VI. REFERENCE BOOKS:

1. Hemanth sood and LN Mittal, “*Laboratory Manual on Concrete Technology*”, CBS Publishers Pvt. Ltd., New Delhi, 2016.
2. Rixom, R. N., and N. P. Mailvaganam. “*Chemical Admixtures for Concrete*”, Taylor & Francis, 3rd Edition, 2006.
3. Mehta, P. Kumar, and Paulo J. M. Monteiro. “*Concrete: Microstructure, Properties, and*

Materials", McGraw Hill Education, 4th Edition, 2014.

VII. ELECTRONICS RESOURCES:

1. <https://nptel.ac.in/courses/105102012>
2. <https://archive.org/details/gov.in.is.4031.1.1996>
3. <https://archive.org/details/gov.in.is.516.1959>
4. <https://civildigital.com/concrete-lab-tests/>

VIII. MATERIAL ONLINE:

1. Course outline description
2. Laboratory manual

