SEMESTER S5

CONCRETE LAB (MT-2)

Course Code	**PCCEL508**	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	**ESE Marks**	50
Credits	2	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Lab

Course Objectives:

1. To enable experimental evaluation of properties of the materials used for concrete
2. To obtain the characteristics of the materials.

Expt. No.	Experiments
1	Test on Cement: Fineness, normal consistency, initial & final setting time.
2	Test on Cement: Specific gravity and compressive strength
3	Study on soundness of cement.
4	Test on Coarse and Fine Aggregate: Sieve analysis.
5	Test on Coarse and Fine Aggregate: Water absorption, bulk density, void ratio, porosity and specific gravity.
6	Test on bulking of sand.
7	Test on coarse aggregate crushing value
8	Tests on fresh concrete: Measurement of workability of concrete by slump cone test and compacting factor test.
9	Study on workability of concrete by Vee-Bee test and flow test.
10	Concrete mix design by IS code method and casting of cubes, cylinders with designed concrete mixes.
11	Tests on hardened properties of concrete: Compressive, split and flexural strength.
12	Tests on hardened properties of concrete: Modulus of elasticity of concrete
13	Tests on brick, floor and roof tiles as per IS code provision.
14	Study on Non-destructive tests on hardened concrete (Rebound hammer, ultrasonic pulse velocity and Rebar locator).
15	Study on concrete core cutter, concrete penetrometer and crack detection microscope.

Minimum of 12 experiments from among the 15 experiments listed, is to be completed.

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Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- ***Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.***
- ***Endorsement by External Examiner:*** *The external examiner shall endorse the record*

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	To describe the basic properties of cement	K3
CO2	To characterize the physical and mechanical properties of various aggregates.	K3
CO3	To experimentally evaluate the fresh and hardened properties of concrete	K3
CO4	To interpret the quality of various construction materials as per IS Code provisions.	K3

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2							2			2
CO2	3	2							2			2
CO3	3	2							2			2
CO4	3	2			2	2		2	2			3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Concrete Technology, Theory and Practice	M. S. Shetty, A.K Jain	S.Chand & Company	2019

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Concrete Manual	M. L. Gambhir	Dhanpat Rai & Sons, Delhi.	2004
2	Properties of Concrete	A. M. Neville	Pitman	2011
3	IS codes on cement: IS 1489(Part 1& 2):2015, IS 269:2015, IS 8112: 2013, IS 4031 (Part 1):1996, IS 4031 (Part 3):1988, IS 4031 (Part 4): 1988, IS 4031 (Part 5): 1988, IS 4031 (Part 6): 1988, IS 4031 (Part 11): 1988, IS 5513: 1996			
4	IS codes on aggregate: IS 2386(Part 1):1963, IS 2386(Part 3):1963, IS 2386 (Part 4): 1963, IS 383:2016			
5	IS codes on fresh and hardened concrete: IS 1199(Part1 to 7): 2018, IS 10262:2019, IS 516 Part 1 Sec 1: 2021, IS 516 Part 5 (Sec 1 to 4), IS 516 Part 8 Sec 1: 2020, IS 14858: 2000, IS 13311 (Part 2):1992			
6	IS codes on brick and tiles: IS 3495 (Part 1 to 6): 2019, IS 1077:1992, IS 654:2023, IS 1237: 2012, IS 13630 (Part 1): 2019, IS 13630 (Part 2): 2019, IS 13630 (Part 6): 2019, IS 13630 (Part 15): 2019, IS 5454: 2024			
7	Other relevant latest BIS standards			

Video Links (NPTEL, SWAYAM…)	
Sl No.	**Link ID**
1	https://cs-iitd.vlabs.ac.in/
2	https://ms-nitk.vlabs.ac.in/exp/concrete-mix-design/simulation.html
3	http://digimat.in/nptel/courses/video/105104030/L34.html
4	http://acl.digimat.in/nptel/courses/video/105102012/L17.html

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Continuous Assessment (25 Marks)

1. **Preparation and Pre-Lab Work (7 Marks)**
   - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (7 Marks)**
   - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
   - Teamwork: Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (6 Marks)**
   - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
   - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (5 Marks)**
   - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

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Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
   - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
   - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
   - Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
   - Creativity and logic in algorithm or experimental design.

2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**
    - Setup and Execution: Proper setup and accurate execution of the experiment or programming task.
3. **Result with Valid Inference/Quality of Output (10 Marks)**
    - Accuracy of Results: Precision and correctness of the obtained results.
    - Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.
4. **Viva Voce (10 Marks)**
    - Ability to explain the experiment, procedure results and answer related questions
    - Proficiency in answering questions related to theoretical and practical aspects of the subject.
5. **Record (5 Marks)**
    - Completeness, clarity, and accuracy of the lab record submitted

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