



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

## CIVIL ENGINEERING

### COURSE DESCRIPTOR

Course Title	TRANSPORTATION MATERIALS LABORATORY				
Course Code	ACE110				
Programme	B.Tech				
Semester	VI	CE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	-	-	-	3	2
Chief Coordinator	Mr. B Suresh, Assistant Professor				
Course Faculty	Dr. Shruthi Kavati, Associate Professor Mr. B. Suresh, Assistant Professor				

#### I. COURSE OVERVIEW:

The aim of this course is to conduct experiments on basic principles of Transportation materials laboratory and it is further extended to know the values and strengths of materials like bitumen, cement and aggregates. The experiments on Transportation materials testing is been done under different site conditions and environmental conditions. The course deals with equipment like Abrasion test, Specific gravity, fineness of cement, Impact crushing strength. This course includes experiments and practical studies with Cement, Aggregates, sand and Bitumen.

#### II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACE007	IV	Building Materials Construction and Planning	3
UG	ACE108	V	Concrete Technology Laboratory	2

#### III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Transportation Materials Laboratory	70 Marks	30 Marks	100

#### IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✗	Chalk & Talk	✓	Quiz	✓	Assignments	✗	MOOCs
✓	LCD / PPT	✓	Seminars	✗	Mini Project	✓	Videos
✗	Open Ended Experiments						

#### V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

**Semester End Examination (SEE):** The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

#### Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	Laboratory		Total Marks
	Type of Assessment		
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

#### Continuous Internal Examination (CIE):

One CIE exams shall be conducted at the end of the 16<sup>th</sup> week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	Performance	Calculations and Graph	Results and Error Analysis	Viva	Total
2	2	2	2	2	10

## VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Presentation on real-world problems
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Presentation on real-world problems
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	1	Seminars

**3 = High; 2 = Medium; 1 = Low**

## VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	<b>Engineering knowledge:</b> Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	2	Presentation on real-world problems
PSO 2	<b>Broadness and diversity:</b> Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	-	-
PSO 3	<b>Self-learning and service:</b> Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	-	-

**3 = High; 2 = Medium; 1 = Low**

## VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Identify the properties and behavior of highway material for different loading patterns.
II	Demonstrate tests on transportation materials like aggregate, bitumen, sand etc. and check their suitability
III	Understand the properties of cement by conducting setting time, specific gravity and compressive strength tests.
IV	Understand techniques to characterize various pavement materials through relevant tests.

**IX. COURSE LEARNING OUTCOMES (CLOs):**

<b>CLO Code</b>	<b>CLO's</b>	<b>At the end of the course, the student will have the ability to:</b>	<b>PO's Mapped</b>	<b>Strength of Mapping</b>
ACE110.01	CLO 1	Understand the engineering properties of highway materials.	PO1, PO2, PO3	2
ACE110.02	CLO 2	Determination of aggregate crushing test values on highway materials.	PO1, PO2, PO3	2
ACE110.03	CLO 3	Determination of aggregate impact test values on highway materials.	PO1, PO2	2
ACE110.04	CLO 4	Determination of specific gravity and water absorption test	PO1, PO2, PO3	3
ACE110.05	CLO 5	Determination the attrition test on coarse aggregates	PO1, PO2	3
ACE110.06	CLO 6	Perform abrasion test on coarse aggregates	PO1, PO2, PO3	2
ACE110.07	CLO 7	Measurement of percentage of flakiness and elongation in coarse aggregates	PO1, PO2	2
ACE110.08	CLO 8	Determination of Penetration value of bitumen sample.	PO1, PO2	1
ACE110.09	CLO 9	Determination of ductility value of bituminous materials	PO1, PO2, PO3	2
ACE110.10	CLO 10	Determination of softening point value of bituminous materials.	PO2, PO3	3
ACE110.11	CLO 11	Calculate the flash point value of bitumen sample	PO1, PO2	3
ACE110.12	CLO 12	Calculation of normal consistency and fineness of cement	PO1	3
ACE110.13	CLO 13	Calculation of initial setting time and final setting time of cement.	PO2, PO3	2
ACE110.14	CLO 14	Calculation the specific gravity and soundness of cement.	PO1, PO2	2
ACE110.15	CLO 15	Calculation the compressive strength of cement	PO2, PO3	2
ACE110.16	CLO 16	Calculation the compressive strength of concrete	PO1, PO2	2
ACE110.17	CLO 17	Calculation the bulking of sand sample	PO1, PO2	2

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**X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

<b>Course Learning Outcomes (CLOs)</b>	<b>Program Outcomes (POs)</b>												<b>Program Specific Outcomes (PSOs)</b>		
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CLO 1	3	2	1										3		
CLO 2	2	2	1										2		
CLO 3	3	1											2		
CLO 4	2	2	2										2		
CLO 5	3	3											3		
CLO 6	3	2	1										2		

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 7	2	2											2		
CLO 8	2	1											3		
CLO 9	2	2	2										1		
CLO 10		3	3										2		
CLO 11	3	3											1		
CLO 12	3												1		
CLO 13		1	2										1		
CLO 14	2	3											1		
CLO 15		2	1										1		
CLO 16	2	2											1		
CLO 17	2	2											2		

3 = High; 2 = Medium; 1 = Low

#### XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO2,PO3, PSO1	SEE Exams	PO1,PO2,PO3, PSO1	Assignments	-	Seminars	-
Laboratory Practices	PO1,PO2, PO3	Student Viva	PO1,PO2, PO3	Mini Project	-	Certification	-

#### XII. ASSESSMENT METHODOLOGIES - INDIRECT

✓	Early Semester Feedback	✓	End Semester OBE Feedback
✗	Assessment of Mini Projects by Experts		

#### XIII. SYLLABUS

LIST OF EXPERIMENTS	
Week-1	<b>INTRODUCTION TO TRANSPORTATION MATERIALS LABORATORY – I</b>
Introduction to transportation material laboratory. Do's and Don'ts in materials lab.	
Week-2	<b>AGGREGATE CRUSHING STRENGTH TEST</b>
Batch I: Measurement of Aggregate crushing test. Batch II: Measurement of Aggregate crushing test.	

<b>Week-3</b>	<b>AGGREGATE IMPACT TEST</b>
Batch I: Measurement of Aggregate Impact test Batch II: Measurement of Aggregate Impact test	
<b>Week-4</b>	<b>SPECIFIC GRAVITY AND WATER ABSORPTION TEST</b>
Batch I: Calculation of specific gravity and water absorption test. Batch II: Calculation of specific gravity and water absorption test.	
<b>Week-5</b>	<b>ATTRITION TEST OF COARSE AGGREGATES</b>
Batch I: Perform Attrition test of coarse aggregates. Batch II: Perform Attrition test of coarse aggregates.	
<b>Week-6</b>	<b>ABRASION TEST OF COARSE AGGREGATES</b>
Batch I: Perform Abrasion test on coarse aggregates. Batch II: Perform Abrasion test on coarse aggregates.	
<b>Week-7</b>	<b>SHAPE TESTS OF COARSE AGGREGATES</b>
Batch I: Measurement of percentage of Flakiness in coarse aggregates. Batch II: Measurement of percentage of Elongation in coarse aggregates.	
<b>Week-8</b>	<b>PENETRATION TEST OF BITUMINOUS MATERIALS</b>
Batch I: Find the Penetration value of bitumen sample. Batch II: Find the Penetration value of bitumen sample.	
<b>Week-9</b>	<b>DUCTILITY TEST OF BITUMINOUS MATERIALS</b>
Batch I: Find the Ductility value of bituminous materials Batch II: Find the Ductility value of bituminous materials.	
<b>Week-10</b>	<b>SOFTENING POINT OF BITUMEN MATERIALS</b>
Batch I: Find the softening point value of bituminous materials. Batch II: Find the softening point value of bituminous materials	
<b>Week-11</b>	<b>FLASH AND FIRE POINT TEST OF BITUMEN MATERIALS</b>
Batch I: Find the flash point value of bitumen sample. Batch II: Find the flash point value of bitumen sample	
<b>Week-12</b>	<b>NORMAL CONSISTENCY OF FINENESS OF CEMENT</b>
Batch I: Perform test and find the normal consistency of fineness of cement. Batch II: Perform test and find the normal consistency of fineness of cement.	
<b>Week-13</b>	<b>INITIAL SETTING TIME AND FINAL SETTING TIME OF CEMENT</b>
Batch I: Find the Initial setting time of cement. Batch II: Find the Final setting time of cement.	
<b>Week-14</b>	<b>SPECIFIC GRAVITY AND SOUNDNESS OF CEMENT</b>
Batch I: Find the specific gravity of cement. Batch II: Find the soundness of cement.	
<b>Week-15</b>	<b>COMPRESSIVE STRENGTH OF CEMENT</b>
Batch I: Find the compressive strength of cement. Batch II: Find the compressive strength of cement.	
<b>Week-16</b>	<b>COMPRESSIVE STRENGTH OF CONCRETE</b>
Batch I: Find the compressive strength of concrete. Batch II: Find the compressive strength of concrete.	
<b>Week-17</b>	<b>BULKING OF SAND</b>
Batch I: Find the bulking of sand sample. Batch II: Find the bulking of sand sample.	

#### XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week No.	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Introduction to Transportation materials laboratory	CLO 1	T1, T2
2	Measurement of aggregate crushing strength test.	CLO 1	T1, T2
3	Measurement of aggregate impact test	CLO 2	T1, T2
4	Calculation of specific gravity and water absorption test	CLO 3	T1, T2
5	Perform attrition test of coarse aggregate	CLO 4	T1, T2
6	Perform abrasion test on coarse aggregates	CLO 5	T1, T2
7	Measurement of percentage of flakiness in coarse aggregates.	CLO 6	T1, T2
8	Find the Penetration value of bitumen sample	CLO 7	T1, T2
9	Find the ductility value of bituminous materials.	CLO 8	T1, T2
10	Find the softening point value of bituminous materials.	CLO 9	T1, T2
11	Find the flash point value of bitumen sample	CLO 10	T1, T2
12	Perform test and find the normal consistency of fineness of cement	CLO 11	T1, T2
13	Find the initial setting time of cement	CLO 12	T1, T2
14	Find the specific gravity of cement.	CLO 13	T1, T2
15	Find the compressive strength of cement.	CLO 14	T1, T2
16	Find the compressive strength of concrete.	CLO 15	T1, T2
17	Find the bulking of sand sample.	CLO 16	T1, T2

#### XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To know about the pavement design analysis.	Open ended problems	PO 1, PO 2	PSO 1
2	To know about the traffic signal coordination	Seminars	PO 2, PO3	PSO 1

**Prepared by:**

Mr. B Suresh, Assistant Professor

**HOD, CE**