



National Certificate of Level-4 in Construction Material Technician



National Certificate of Level -4 in Construction Material Technician

CURRICULUM



**NATIONAL VOCATIONAL AND TECHNICAL TRAINING COMMISSION (NAVTTTC)
GOVERNMENT OF PAKISTAN**



National Certificate of Level-4 in Construction Material Technician



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1. Introduction

Materials which are used for construction purposes are known as the engineering materials or building materials or construction materials. A wide range of building materials are available for the construction of rural buildings and structures. The proper selection of materials to be used in a particular building or structure can influence the Safety, original cost, maintenance, ease of cleaning, durability and, of course, appearance. Usually, construction materials are classified into natural construction material (Water, Mud, Stone, Sand, Wood, Leaves, Lime, Fiber and etc.) and artificial construction material (cement, Brick, Tiles, Glass, Metals, Plastic and etc.). It is necessary for the Civil Engineers/Civil Technologist/Lab Engineers/Lab Assistant to have knowledge about materials, properties and their standard testing methods.

Construction Materials Testing have significant role in the life of every human being, though one may not truly sense its importance in our daily routine. Thus, the importance of civil engineering may be determined according to its usefulness in our daily life. Therefore, industry expectations for skilled workforce are also dynamic which can only be managed through setting relevant competency standards in collaboration with the leading industries. Being familiar of this fact, National Vocational & Technical Training Commission (NAVTTTC) developed competency standards for Construction Material Testing Technology under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading Construction, Real States & Builder industry of the country.

2. Purpose of the Qualification:

The purpose of this qualification is to set high professional standards for construction Materials Testing technology sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of the trainees
- Provide opportunities for recognition of skills attained through non-formal or informal pathways
- Improve the quality and effectiveness of training and assessment for construction Materials Testing industry
- Enable the existing workforce to capacitate themselves in new technologies and methods



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3. Overall objectives of training program

The Construction Material Technician qualification of level 4 consists of both the theoretical and practical details and having the following Occupations

- | | | |
|----|---|---------|
| 1. | Building Materials Technician | Level 4 |
| 2. | Highway Quality Control Inspector | Level 4 |
| 3. | Bridge Inspector (NDT) | Level 4 |
| 4. | Public Health Quality Control Inspector | Level 4 |
| 5. | Construction Plants Operator | Level 4 |
| 6. | Field Testing Lab Technician | Level 4 |

It includes the following qualifications as well:

- | | | |
|----|--|---------|
| 1. | Certificate in Construction Materials Sampler | Level 2 |
| 2. | Certificate in Construction Materials Assistant | Level 3 |
| 3. | Certificate in Construction Materials Technician | Level 4 |
| 4. | Diploma in Construction Materials Supervisor | Level 5 |

4. Date of Validation

The level 4 of National qualification on construction Materials Technician has been validated by the Qualifications Development Committee (QDC) members on **06-12-2021 to 10-12-2021** and will remain valid for 10 years

5. Entry level of trainees

The entry for National Certificate level 4, in Construction Material Technician are

1. A person having National Vocational Certificate level 3, in Construction Material Technician.



6. Minimum qualification for teachers

- B. Tech in Civil Technology 4 Years
- B.Sc. / B.E. in Civil Engineering 4 Years
- D. A. E. in Civil Technology with 3 Years teaching experience
- Must be able to communicate effectively

Medium of instruction

English, and Urdu.

7. Duration of the course:

The proposed curriculum is composed of 145 modules that will be covered in 3617 Learning hours. Duration of the course is proposed to be Three years. The total weightage for technical modules is 3617 hours. A total of 1183 hours have been reserved for allied subjects i.e. Islamic studies, English, Mathematics, Physics and Chemistry.

The details of technical modules are given as under:

Level - 2 = 6 months.

Level - 3 = 6 months.

Level - 4 = 1 Year.

Level - 5 = 1 Year.

The overall distribution of contact hours and Credit Hours is given below:

Total.	3617 hours. & 361.7 Credits
Theory.	847 hours (23.42 %)
Practical.	2770 hours (76.58 %)

The distribution of contact hours and credit hours in each level is given below:



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Level - 2 = 6 months (16 weeks)

Total. **610 hours. & 61 Credits**
Theory. **115 hours (18.85 %)**
Practical. **495 hours (81.15 %)**

Level - 3 = 6 months (16 weeks)

Total. **607 hours. & 60.7 Credits**
Theory. **121 hours (19.93 %)**
Practical. **486 hours (80 .07%)**

Level - 4 = 1 Year (16 weeks + 16 Weeks)

Total. **1200 hours. & 120 Credits**
Theory. **234 hours (19.5 %)**
Practical. **966 hours (80.5 %)**

Level - 5 = 1 Year (16 weeks + 16 Weeks)

Total. **1200 hours. & 120 Credits**
Theory. **377 hours (31.42 %)**
Practical. **823 hours (68.58 %)**

8. Description and structure of the course

Following is the structure of the course:

National Qualification Certificate in Construction Material Technician Level 4 Part I

11.08 Construction Practices II

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.08.1	Prepare subgrade, base, and bedding course for paving	Core	4	4	9	13	1.3



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11.08.2	Lay paving	Core	4	2	6	8	0.8
11.08.3	Carry out reinforced concrete work	Core	4	4	9	13	1.3
11.08.4	Produce sketches of bridges w.r.t. material of construction	Core	4	6	12	18	1.8
11.08.5	Produce sketches of permanent Way	Core	4	4	12	16	1.6
11.08.6	Produce sketches of station yards and signals	Core	4	6	24	30	3
11.08.7	Produce sketches of canals and head works	Core	4	6	24	30	3
Total			32	96	128	12.8	

11.09 Soil Testing

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.09.1	Determine Basic Properties of soil	Core	4	4	24	28	2.8
11.09.2	Determine Atterberg's Limits	Core	4	3	9	12	1.2
11.09.3	Classify Soils	Core	4	3	12	15	1.5
11.09.4	Conduct soil compaction tests in field	Core	4	3	12	15	1.5
11.09.5	Conduct soil compaction tests in Lab	Core	4	3	16	19	1.9
11.09.6	Determine permeability of soil	Core	4	4	30	34	3.4
11.09.7	Determine the shear strength of soil	Core	4	4	24	28	2.8
11.09.8	Conduct California Bearing Tests	Core	4	4	33	37	3.7
11.09.9	Find out bearing capacity of soil	Core	4	4	32	36	3.6
Total			32	192	224	22.4	

11.10 Concrete Testing

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.10.1	Test the Properties of Fresh Concrete	Core	4	6	21	27	2.7
11.10.2	Perform the Quality Tests on Fine Aggregates for Concrete	Core	4	4	12	16	1.6



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11.10.3	Perform Quality tests on Coarse Aggregates for Concrete Mix Design	Core	4	6	18	24	2.4
11.10.4	Perform quality tests for Cement	Core	4	6	24	30	3
11.10.5	Perform Destructive Tests on Hardened Concrete	Core	4	6	24	30	3
11.10.6	Evaluate Concrete Mix Design	Core	4	4	32	36	3.6
Total			32	131	163	16.3	

11.11 Water and Waste Water Testing

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.11.1	Determine the inorganic matters in water and wastewater.	Core	4	2	14	16	1.6
11.11.2	Determine the Organic Matters in water and wastewater.	Core	4	3	12	15	1.5
11.11.3	Determine the Physical Characteristics in water and wastewater.	Core	4	3	12	15	1.5
11.11.4	Determine the Hardness in Water and Wastewater.	Core	4	2	8	10	1
11.11.5	Determine the bacteriological impurities in Water and Wastewater.	Core	4	4	20	24	2.4
Total				14	66	80	8
Grand Total of Level-4 (Part-I)				110	485	595	59.5

National Qualification Certificate in Construction Material Technician Level 4 Part II

11.12 Soft Skills

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.12.1	Manage meetings	Generic	4	3	6	9	0.9
11.12.2	Manage workforce planning	Generic	4	6	12	18	1.8
11.12.3	Undertake project work	Generic	4	3	12	15	1.5



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11.12.4	Identify and communicate trends in career development	Generic	4	4	12	16	1.6
11.12.5	Work safely in an office environment	Generic	4	3	9	12	1.2
11.12.6	Develop workplace documents	Generic	4	6	12	18	1.8
11.12.7	Maintain professionalism in the workplace	Generic	4	3	9	12	1.2
11.12.8	Organize schedules	Generic	4	4	24	28	2.8
Total				32	96	128	12.8

11.13 Highway Materials Testing

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.13.1	Determine the Physical properties of road metals	Core	4	2	12	14	1.4
11.13.2	Determine the Basic properties of road metals	Core	4	3	18	21	2.1
11.13.3	Determine the Strength properties of road metals	Core	4	3	24	27	2.7
11.13.4	Perform CBR test on road metals	Core	4	2	10	12	1.2
11.13.5	Measure the basic properties of bitumen	Core	4	8	30	38	3.8
11.13.6	Determine the bituminous content in a pavement sample	Core	4	4	12	16	1.6
11.13.7	Determine the Mix Design by Marshall Method	Core	4	6	18	24	2.4
11.13.8	Evaluate the Job Mix Formula for Asphaltic Concrete	Core	4	4	36	40	4
Total				32	160	192	19.2

11.14 Masonry Materials Testing

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.14.1	Perform Physical Test on bricks and blocks	Core	4	6	21	27	2.7
11.14.2	Perform Chemical Test on Bricks and blocks	Core	4	4	8	12	1.2
11.14.3	Perform Strength Test on bricks and blocks	Core	4	4	16	20	2
11.14.4	Perform Physical Test of lime	Core	4	3	12	15	1.5
11.14.5	Perform Chemical Test on Lime	Core	4	4	8	12	1.2



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11.14.6	Perform Strength Test on Lime	Core	4	4	16	20	2
11.14.7	Perform Physical Test on stones	Core	4	8	32	40	4
11.14.8	Perform Chemical Test on stones	Core	4	8	29	37	3.7
11.14.9	Perform Strength Test on stones	Core	4	6	16	22	2.2
Total				47	158	205	20.5

11.15 Testing Properties of Timber

Module Code	Name of Subjects	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.15.1	Perform the Strength Tests on Wood	Core	4	5	28	33	3.3
11.15.2	Perform the Hardness and impact test on timber	Core	4	3	19	22	2.2
11.15.3	Determine properties and types of locally manufactured timber	Core	4	3	11	14	1.4
11.15.4	Make simple calculations of timber	Core	4	2	9	11	1.1
Total				13	67	80	8
Grand Total of Level-4 (Part-I)				124	481	605	60.5
Grand Total of Level 4				234	966	1200	120



9. Overview of the Curriculum.

Construction Material Testing Technology Level-4 Part-I

S#	Clusters of Competencies	Numbers of Module	Theory	Practice	Duration
11.08	Construction Practices II	7	32	96	128
11.09	Soil Testing	9	32	192	224
11.10	Concrete Testing	6	32	131	163
11.11	Water and Waste Water Testing	5	14	66	80
	Total	27	110	485	595

Construction Material Testing Technology Level-4 Part-II

S#	Clusters of Competencies	Numbers of Module	Theory	Practice	Duration
11.12	Soft Skills	8	32	96	128
11.13	Highway Materials Testing	8	32	160	192
11.14	Masonry Materials Testing	9	47	158	205
11.15	Testing Properties of Timber	4	13	67	80
	Total	29	124	481	605
	Grand Total of Level 4	56	234	966	1200



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10. Scheme of Studies

National Qualification Certificate in “Construction Material Technician” level-4, Part-1

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
11.08	Construction Practices II	Technical	32	96	128	12.8	2	6	8
11.09	Soil Testing	Technical	32	192	224	22.4	2	12	14
11.10	Concrete Testing	Technical	32	131	163	16.3	2	8	10
11.11	Water and Waste Water Testing	Technical	14	66	80	8	1	4	5
		Allied							
		Allied							
Total			110	485	595	59.5	7	30	37

National Qualification Certificate in “Construction Material Technician” level-4, Part-2

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
11.12	Soft Skills	Generic	32	96	128	12.8	2	6	8
11.13	Highway Materials Testing	Technical	32	160	192	19.2	2	10	12
11.14	Masonry Materials Testing	Technical	47	158	205	20.5	3	10	13
11.15	Testing Properties of Timber	Technical	13	67	80	8	1	4	5
		Allied							
		Allied							
Total			124	481	605	60.5	8	30	38
Grand Total			234	966	1200	120	15	60	75



11. Detail of Modules Level wise

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11.8 Construction Practices II

11.8.1. Prepare subgrade, base, and bedding course for paving

Objective: This module covers the skills and knowledge required to prepare subgrade, base and bedding course in preparation for laying paving.

Duration: 13 Hours

Theory: 4 Hours

Practice: 9 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for work	Trainee will be able to: - Confirm work instructions with supervisor. - Select required tools and equipment, check for serviceability and any faults. - Calculate materials quantity requirements in accordance with specifications. - Obtain materials needed and check for compliance.	- Explain types of materials - Explain Knowledge of Selection of Required Tools. - Explain Methods for calculation of required Quantity. Practical Activity: Select required tools and Calculate required quantity in accordance with specification.	Theory-0.8Hrs Practice-1.5Hrs Total- 2.3Hrs	Pencil Rubber Sharpener Calculator	Lab



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LU2. Identify soil	Trainee will be able to: - Identify class of soil used as per soil classification charts. - Determine properties of soil assessed to its class. - Determine subgrade requirements of penetration tests.	- Described types of soil - Explain properties of bedding course materials. - Explain properties of geotextile materials. - Explain standard penetration test (SPT) Practical Activity: Perform penetration test of soil.	Theory-0.8Hrs Practice-1.5Hrs Total- 2.3Hrs	Pencil Rubber Sharpener Practical book Calculator Penetration Test Apparatus	Class & Lab
LU3. Prepare subgrade	Trainee will be able to: - Identify drainage and other features within the area to be paved. - Identify drains put in place where required - Identify services in work area - Identify damp proof courses and paving is constructed so that it does not compromise them. - Components are cleaned, stacked and stored for reuse or bundled for removal.	- Define subgrade - Describe drainage and other features with in the Area. - Explain types of damp proof courses and paving. - Explain building services - Explain stabilizing bedding sand Practical Activity: - Identify drainage and other features within the area to be paved. - Identify suitable vertical and horizontal damp-proof courses (DPC) for a specific job.	Theory-0.8Hrs Practice- 2Hrs Total- 2.8Hrs	Pencil Rubber Sharpener Practical book	Class & Lab



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LU4. Install base course material	Trainee will be able to: - Calculate quantity of base course materials based upon the subgrade type and purpose of the paved area. - Distribute material over area, allowing for compaction. - Perform compaction on area taking care not to over-compact base materials.	- Describe types of base course material and purpose. - Describe different types of compaction, purpose and limits Practical Activity: - Calculate quantity of base course materials based upon the subgrade type and purpose of the paved area. - Perform compaction on area taking care not to over-compact base materials.	Theory-0.8Hrs Practice- 2Hrs Total- 2.8Hrs	Pencil Rubber Sharpener Practical book Calculator	Class & Lab
LU5. Install bedding course materials	Trainee will be able to: - Select bedding course material - Calculate quantity of layer course materials - Distribute material over the area to be paved within tolerances stipulated by relevant standards. - Handle compacting machinery correctly. - Screed base materials to levels as determined, and set out by string lines or other mechanisms. - Clean the work area.	- Describe Bedding course material. - Describe handling of compacting machinery correctly. - Explain relevant AASHTO American Association of State Highway and Transportation Officials Standard. Practical Activity: - Calculate quantity of layer course materials - Practice to set out level by string line with screed base material of a specific area.	Theory-0.8Hrs Practice- 2Hrs Total- 2.8Hrs		Class & Lab



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11.8.2 Lay paving

Objective: This module covers the skills and knowledge required to plan for work, set out work area and lay paving.

Duration: 8 Hours

Theory: 2 Hours

Practice: 6 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Plan for work	Trainee will be able to: - Confirm work instructions with supervisor. - Select tools and equipment are selected as required, check for serviceability and any faults - Calculate material quantity requirements in accordance with specifications. - Obtain and prepare materials needed for compliance	- Explain Knowledge of Selection of Required Tools. - Explain methods for tools / equipment checking for serviceability - Explain Methods for calculation of required Quantity. Practical Activity: - Select required tools and Calculate required quantity in accordance with specification.	Theory-0.50 Hrs Practice-2 Hrs Total- 2.50 Hrs	Pencil Rubber Sharpener Calculator	Lab
LU2. Set out work area	Trainee will be able to: - Identify location and area of paved area from plans and specifications. - Identify sub-soil and footing types according to standards.	- Explain sub-soil and footing types according to standards. - Explain paving bonds and patterns, joints and finishing. - Explain underground services	Theory-0.50 Hrs Practice-2 Hrs Total-2.50 Hrs	Pencil Rubber Sharpener Calculator Fiber Tape Auto Levell	Class & Lab



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	• Locate underground services • Set out location and shape of paving area to dimensions from plans and specifications.	Practical Activity: • Identify location and area of paved area from plans and specifications. • Locate underground services			
LU3.Lay paving	Trainee will be able to: • Excavate area is to required depth, allowing for base and thickness of unit and specified finish level. • Position drainage pipes in sub soil in accordance with plans and specifications. • Mix mortar for masonry paving to specifications and standards. • Spread substrate base material and compact to specifications. • Spread and screed bedding material is spread to designed level and alignment. • Position edge boards to set out and specifications. • Grade paving surface to fall evenly, without ponding, to outlets or surface run-off system.	• Define lay paving and types of paving • Explain characteristics and applications of materials for laying pavers • Understanding to technical drawing • Describe plans and specifications • Explain techniques for laying pavers Practical Activity: • Identify Position for drainage pipes in sub soil in accordance with plans and specifications. • Perform Lay paving	Theory- 1 Hrs Practice-2 Hrs Total- 3 Hrs	Bolsters Brick buggies Buckets Builders' lines Builders squares Concrete mixers Forklifts Hammers Hoses Line blocks Line pins Masonry saws Mason's squares measuring tapes and rules Mortar boards	Class & Lab



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	• Determine initial starting line is and lay pavers to line conforming to specified pattern. • Cut paving units and segments and lay to designed pattern and specifications, with joints to specifications and surface finish aligned. • Maintain finished level is across junctions between different finishes. • Complete paving installation with joints finished to specifications. • Clean paving surface according to specifications.			Pallet trolleys	
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11.8.3 Carry out reinforced concrete work

Objective: This module covers the skills and knowledge required to plan and prepare work, place and fix reinforcement, carry out concrete placement and clean-up work site area.

Duration: 13 Hours

Theory:4 Hours

Practice:9 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Plan and prepare work	Trainee will be able to: - Recognize quality assurance requirements of construction operations and adhered to. - Recognize OH&S requirements for application tasks and workplace environment adhered to. - Identify reinforcement, type of fixing and locations from instructions/reinforcement schedule, job drawings and specifications. - Check formwork/excavation for completion and conformity to receive reinforcement. - Select, fit and use appropriate personal protective equipment	- Explain Quality insurance requirement for construction operation. - Explain workplace and equipment safety requirements - Knowledge of drawings and specifications - Described reinforcement and bar bending schedule of rebar - Knowledge of formwork /excavation Practical Activity: - Identify reinforcement, type of fixing and locations from	Theory- 1 Hrs Practice- 2 Hrs Total- 3 Hrs	Pencil Rubber Sharpener Calculator Note book Measuring tape/rule	Class + Lab



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	correctly. • Select tools and equipment consistent with job requirements • Check delivered reinforcement for correct size type and quantities against reinforcement schedule/details shown in job detail drawings	instructions/reinforcement schedule, job drawings and specifications. • Check delivered reinforcement for correct size, type and quantities against reinforcement schedule/details shown in job detail drawings. • Check formwork/excavation for completion and conformity to receive reinforcement.			
LU2. Place and fix reinforcement	Trainee will be able to: • Cut and bend reinforcement bars to required set -out and drawing details. • Tie bars to designed configuration from drawings. • Cut reinforcement sheets to required sizes, where applicable. • Attach stiffening rods to panels to instructions as required to facilitate handling processes • Locate bar chairs/spacers to requirements of reinforcement	• Describe list of portable power tools, hand tools • Describe reinforcement and bar bending schedule • Describe tie bars / dowels and their purpose • Describe binding procedure with MS binding wire of rebar • Describe bar chairs/spacers Practical Activity: • Prepare bar bending Schedule. • Locate bar chairs/spacers to the	Theory- 1 Hrs Practice- 2 Hrs Total- 3 Hrs	Pencil Rubber Sharpener Calculator Note book Measuring tape/rule Reinforcement bender	Class + Lab



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	schedule and job drawings.	requirements of reinforcement schedule and job drawings			
LU3.. Carry out concrete placement	Trainee will be able to: • Provide assistance with the undertaking of relevant concrete tests. • Transport concrete correctly and safely with wheelbarrow and discharge into formwork using correct manual handling techniques. • Place concrete to instruction, minimizing spillage. • Compact concrete to specification and instruction using immersion vibrator or other specified method. • Screed concrete to specified levels/grades as per instructions. • Finish concrete to instruction to specified surface finish. • Identify and apply curing process. • Cover concrete surface adequately with appropriate material to support curing process and protect it from damage.	• Define plant and equipment • Describe formwork for concrete • Describe materials handling • Describe curing process and purpose of curing Practical Activity: • Transport concrete correctly and safely with wheelbarrow and discharge into formwork using correct manual handling techniques. • Identify and apply curing process.	Theory- 1 Hrs Practice- 3 Hrs Total- 4 Hrs	Shovels and rakes Wooden floats Steel floats Bull floats Immersion vibrator or vibrating table Tarpaulins/c overs Curing agent applicator Steam generator Wheel barrow Tamping rods Screed boards Edging tool Brooms Bolt cutters Hacksaw Wire nippers Tie wire	Class + Lab



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LU4.Clean-up work site area	Trainee will be able to: • Clear works are by disposing of materials (reused or recycled) in accordance to legislation and regulations • Clean, check, maintain and store tools and equipment according to requirement	• Describe significance of clean-up work site area • Describe steps for disposing of material in accordance to legislation and regulations • Enlist tools and equipment for cleaning up of site area. Practical Activity: • Perform Clean-up work site area in accordance to legislation and regulations	Theory- 1 Hrs Practice- 2 Hrs Total- 3 Hrs	Shovels and rakes Wheel barrow	Class + Lab
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11.8.4. Produce sketches of bridges w.r.t. material of construction

Objective: This module covers the skills and knowledge required to draw sketches of timber, masonry, steel, R.C.C and pre stressed concrete bridges.

Duration: 18 Hours

Theory: 6 Hours

Practice:12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw sketch of timber bridge	Trainee will be able to: - Identify drawing tools for drawing - Fix drawing sheet on drafting table - Draw sketch of timber bridge - Label the structural components of timber bridge	- Introduction to drawing and sketching - Explain Types of Timber and Uses of Timber. - Explain Necessity and Suitability of Timber. - Explain Comparison of various types of timber - Explain different types of timber bridge and its components Practical Activity: - Draw sketch of timber bridge and Label the structural components of timber bridge.	Theory-1 Hrs Practice-2 Hrs Total- 3 Hrs	Pencil Rubber Sharpener Calculator Note book	Class + Lab



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LU2. Draw sketch of masonry bridge	Trainee will be able to: - Identify drawing tools for drawing - Fix drawing sheet on drafting table - Draw sketch of masonry bridge - Label the structural components of masonry bridge	- Explain Types of Masonry and Uses of Masonry. - Explain Necessity and Suitability of Masonry. - Explain Comparison of various types of masonry - Explain different components of masonry bridge Practical Activity: - Draw sketch of Masonry bridge and Label the structural components of Masonry bridge.	Theory-1 Hrs Practice- 2 Hrs Total- 3 Hrs	Pencil Rubber Sharpener Calculator Note book	Class + Lab
LU3. Draw sketch of steel bridge	Trainee will be able to: - Identify drawing tools for drawing - Fix drawing sheet on drafting table - Draw sketch of steel bridge - Label the structural components of steel bridge	- Explain Types of Steel and Uses of Steel. - Explain Necessity and Suitability of Steel. - Explain different components of steel bridge and their functions - Explain Comparison of various types of steel. Practical Activity: Draw sketch of Steel bridge and Label the structural components of Steel bridge.	Theory-1 Hrs Practice-2 Hrs Total- 3 Hrs	Pencil Rubber Sharpener Calculator Note book	Class + Lab



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LU4. Draw sketch of R.C.C bridge	Trainee will be able to: - Identify drawing tools for drawing - Fix drawing sheet on drafting table - Draw sketch of R.C.C bridge - Label the structural components of R.C.C bridge	- Explain Types of R.C.C and Uses of R.C.C - Explain Necessity and Suitability of R.C.C - Explain Comparison of various types. - Explain structural components of RCC bridge Practical Activity: Draw sketch of R.C.C bridge and Label the structural components of R.C.C bridge.	Theory-1.5 Hrs Practice-3 Hrs Total- 4.5 Hrs	Pencil Rubber Sharpener Calculator Note book	Class + Lab
LU5. Draw sketch of pre stressed concrete bridge	Trainee will be able to: - Identify drawing tools for drawing - Fix drawing sheet on drafting table - Draw sketch of pre stressed concrete bridge - Label the structural components of pre stressed concrete	- Introduction of pre stressed concrete - Explain bridge and its components - Explain Types of pre stressed concrete and Uses of pre stressed concrete. - Explain Necessity and Suitability of pre stressed concrete. - Explain Comparison of various types. Practical Activity: - Draw sketch of pre stressed concrete bridge and Label the structural components of pre stressed concrete bridge	Theory-1.5 Hrs Practice-3 Hrs Total- 4.5 Hrs	Pencil Rubber Sharpener Calculator Note book	Class + Lab



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11.8.5. Produce sketches of permanent Way

Objective: This module covers the skills and knowledge required to draw rails sections (double headed, bull headed and flat footed), sketches of rail fastenings, sleeper fastenings, cross section of broad-gauge rail track.

Duration:16 Hours

Theory: 4 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw rails sections (double headed, bull headed and flat footed)	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw rails sections (double headed, bull headed and flat footed) - Perform labelling and dimensioning	- Introduction different types of dimensioning - Introduction of section - Define permanent way - State the requirements of permanent way - Explain Rail Section - Enlist different types of drawing tools. Practical Activity: - Draw rails sections (double headed, bull headed and flat footed) along labelling and dimensioning.	Theory-1 Hrs Practice-3 Hrs Total-4 Hrs	Pencil Rubber Sharpener Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab
LU2. Draw sketches of rail fastenings	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw sketches of rail fastenings	- Explain rail fastenings - Enlist different types of drawing tools. Practical Activity: Draw rail fastenings along labelling and	Theory-1 Hrs Practice-3 Hrs Total-4 Hrs	Pencil Rubber Sharpener Note book Drawing Sheets	Class + Lab



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	Label parts of rail fastenings	dimensioning.			
LU3. Draw sketches of sleeper fastenings	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw sketches of sleeper fastenings - Label parts of sleeper fastenings	Introduction of - Introduction - Explain sleeper fastenings and its parts - Introduction of drawing / sketches and different types of drawing tools. Practical Activity: - Draw sleeper fastenings along with labelling and dimensioning of different parts	Theory-1 Hrs Practice-3 Hrs Total-4 Hrs	Pencil Rubber Sharpener Note book Drafting Table, Drawing Sheets	Class + Lab
LU4. Draw cross section of broad-gauge rail track	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw cross section of broad-gauge rail track of in filling - Draw cross section of broad-gauge rail track in cutting - Label components of rail tracks	- Define cross section - Explain cross section of broad-gauge rail track - Enlist different types of drawing tools. Practical Activity: - Draw cross section of broad-gauge rail track along labelling and dimensioning	Theory-1 Hrs Practice-3 Hrs Total- 4 Hrs	Pencil Rubber Sharpener Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab



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11.8.6. Produce sketches of station yards and signals

Objective: This module covers the skills and knowledge required to draw sketch of coaching yard, goods yard, locomotive yard, marshalling yard and sketches of rail signals.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw sketch of coaching yard	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw border lines and title bar - Draw the connection of rails to sleepers	- Introduction of technical drawing and sketches - Explain coaching yard and its purpose - Enlist different types of drawing tools - Define connection of rails to sleepers. Practical Activity: - Draw sketch of coaching yard along labelling and dimensioning	Theory-1.5Hrs Practice-5 Hrs Total- 6.5 Hrs	Pencil Rubber Sharpener Note book Drafting Table, Drawing Sheets	Class + Lab
LU2. Draw sketch of goods yard	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw border lines and title bar - Draw cross section of broad-gauge rail track in cutting	- Explain different type of yards - Explain goods yard - Enlist different types of drawing tools. Practical Activity: - Draw sketch of goods yard along labelling and dimensioning	Theory-1.5Hrs Practice-5 Hrs Total- 6.5Hrs	Pencil Rubber Sharpener Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab



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LU3. Draw sketch of locomotive yard	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw border lines and title bar - Draw cross section of broad-gauge rail track of in filling	- Explain cross section of locomotive yard - Explain locomotive yard - Introduction of drawing and different types of drawing tools. Practical Activity: - Draw sketch of locomotive yard along labelling and dimensioning.	Theory-1 Hrs Practice- 4.5Hrs Total- 5.5Hrs	Pencil Rubber Sharpener Note book Drafting Table, Drawing Sheets	Class + Lab
LU4. Draw sketch of marshaling yard	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw border lines and title bar - Draw various types of rails	- Explain marshaling yard and purpose - Introduction of drawing, dimensioning and different types of drawing tools Practical Activity: - Draw sketch of marshaling yard along labelling and dimensioning.	Theory-1 Hrs Practice-4.5Hrs Total-5.5 Hrs	Pencil Rubber Sharpener Note book Drafting Table, Drawing Sheets	Class + Lab
LU5. Draw the sketches of rail signals	Trainee will be able to: - Identify drawing tools - Fix drawing sheet on drafting table - Draw border lines and title bar - Draw the sketches of rail signals (semaphore, warning, light disc and dwarf signals)	- Explain types of signals - Explain rail signals and its purpose - Introduction of drawing, dimensioning and different types of drawing tools. Practical Activity: - Draw sketch of rail signals (semaphore, warning, light disc and dwarf signals) along labelling and dimensioning.	Theory-1 Hrs Practice-5Hrs Total- 6Hrs	Pencil Rubber Sharpener Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab



11.8.7 Produce sketches of canals and head works

Objective: This module covers the skills and knowledge required to draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages, Draw the plan of a multipurpose irrigation project, draw a plan showing general layout of river training and protection works, draw cross section of dams, draw a plan showing the general layout of head works of a perennial canal, draw cross-sections of a weir floors, Draw the plan and section of a silt ejector

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Draw map of Pakistan. • Show rivers on map. • Draw barrages, main canals, head works and link canals	• Introduction to technical drawing and drawing instruments • Describe with map the irrigation network in Pakistan. • State the characteristics of Pakistan's rivers. • Explain types of irrigation i.e. flow irrigation and lift irrigation • Explain various sources of irrigation water. Practical Activity: • Draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages.	Theory-0.85 Hrs Practice-3. Hrs Total- 3.85Hrs	Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab
LU2. Draw the plan of	Trainee will be able to:	• Define irrigation	Theory-0.85 Hrs	Calculator Note book	Class + Lab



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a multipurpose irrigation project	• Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Draw plan of project. • Show all details on plans	• State history of irrigation. • State necessity and scope of irrigation. • State merits and demerits of irrigation • Explain irrigation systems Practical Activity: • Draw the plan of a multipurpose irrigation project.	Practice-3 Hrs Total- 3.85Hrs	Drafting Table, Drawing Tools Drawing Sheets	
LU3. Draw a plan showing river training and Protection works.	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Draw plan of training and Protection works. • Show all details on plans	• Define plan • Explain river training and protection work • State the important barrages of Pakistan. • State Indus Basin Project • Explain need and details of replacement works in Indus Basin Project Practical Activity: • Draw a plan showing river training and Protection works.	Theory-0.85 Hrs Practice-3Hrs Total- 3.85Hrs	Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab
LU4. Draw cross section of dams	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet	• Define cross sections • Describe technical drawing • Define dams	Theory-0.85 Hrs Practice-3Hrs Total- 3.85Hrs	Calculator Note book Drafting Table, Drawing	Class + Lab



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	• Set sheet on drawing table as per standards. • Draw x-section of dam. • Label all necessary details on plan.	• Define reservoirs • State the purpose of reservoir and its classification. • Describe the location of site selection for reservoir • State classification of dams i.e. based on function and use, structural design, materials of construction, shape of X-section • State factors to be considered during choice of dam for hydro project • explain the construction details of earthen dams • State the causes of failure of earthen dams and their remedies • Explain methods to control seepage in earthen dams • Explain necessity of raising of dams. • Explain methods of raising dam. Practical Activity: • Draw cross section of dams		Tools Drawing Sheets	
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LU5. Draw a plan showing the general layout of head works of a perennial canal	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Select suitable scale. • Draw layout of head works. • Label all necessary details on plan.	• Describe layout plan • Define perennial canal • Know IRSA (Indus River System Authority) and PIDA (Punjab Irrigation and Drainage Authority) • State the necessity of storage irrigation. • Define the various terms used in storage irrigation. • Explain the methods of assessment of maximum run off from a catchment area Practical Activity: • Draw a plan showing the general layout of head works of a perennial canal	Theory-0.85 Hrs Practice-3Hrs Total- 3.85Hrs	Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab
LU6. Draw cross-sections of a weir floors	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Select suitable scale.	• Describe cross section • Define weir and barrages. • Distinguish between barrages and weirs and explain their purposes. • Describe with sketches the components/parts of a barrage. • State the factors governing the site selection of a barrage.	Theory-0.85 Hrs Practice-3Hrs Total- 3.85Hrs	Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab



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	• Draw weir's section. • Label all necessary details.	• State the types of weirs. • Explain surface flow at weirs. Practical Activity: • Draw cross-sections of a weir floors			
LU7. Draw the plan and section of a silt ejector	Trainee will be able to: • Arrange drawing instruments • Select drawing sheet • Set sheet on drawing table as per standards. • Select suitable scale. • Draw plan and section. • Label all necessary details.	• Introduction to plan and section • Describe the necessity and importance of regulation and silt controlling works. • Explain head regulator and its types, i.e. flume, meter flume. • Describe with sketches the silt ejector, silt vanes, silt excluder and skimming platform. • Describe the necessity and importance of regulation and silt controlling works. • Describe with sketches the silt ejector, silt vanes, silt excluder and skimming platform. • List the objects of river training. • Explain with sketches different types of protective and river training works. Practical Activity: • Draw the plan and section of a silt ejector	Theory-0.9 Hrs Practice-6Hrs Total-6.9Hrs	Calculator Note book Drafting Table, Drawing Tools Drawing Sheets	Class + Lab



11.9 Soil Testing

11.9.1 Determine Basic Properties of soil

Objective: This module covers the skills and knowledge required to determine soil moisture content by Speedy moisture, establish soil moisture content by oven drying and Identify specific gravity of soil sample by pycnometer

Duration: 28 Hours

Theory: 4 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Extraction of soil sample	Trainee will be able to: • Select and set all required tools, apparatus/ instrument/ equipment and make them ready for sample extraction as per standards. • Perform soil sample extraction, using core cutter or other methods, as per standard procedure • Carry out weighing, measuring and determine bulk density and moisture content of samples as per specified procedures. • Fill data in the sampling documents • Store and stack the test samples as	• Define soil • State the types of soil samples • Define bulk density • State how to extract soil sample • Enlist the steps in taking soil sample • State how to remediate soil • State how long does it take to remediate soil • State the best timing for soil sampling Practical activity: • Select the sample from the source and prepare sampling document • Inspect and analyze the performance of extraction of soil sample	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Core cutter Weighing balance Container	Class room and lab



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	per specified procedures • Observe safety requirements. • Perform housekeeping as per standard procedure.				
LU2. Determine soil moisture content by Speedy moisture	Trainee will be able to: • Identify apparatus for determining MC by speedy moisture meter as per local standards. • Collect soil sample to be tested • Identify chemical to be used in speedy moisture • Assemble pressure vessel according to specifications. • Record dial reading after shaking the vessel as per standards • Interpret moisture content corresponding to the reading of dial gauge	• Define soil mechanics • Define soil engineering • Define moisture content • State the steps to determine moisture content Practical activity: • Measure moisture content by speedy moisture meter • Interpret moisture content of soil sample	Theory-0.5Hrs Practice-3Hrs Total-3.5Hrs	Clean container Pressure vessel	Class room and lab
LU3. Determine soil moisture content by oven drying (Lab)	Trainee will be able to: • Determine weight of containers • Determine Weight of soil sample with containers • Dry soil sample in oven	• Enlist types of soil • Enlist the steps of determining moisture content by oven drying method Practical activity: • Determine the weight of soil sample	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Container Oven Balance Brush	Class room and lab



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	Evaluate moisture content	Measure the moisture content by oven drying method			
LU4. Evaluate specific gravity of soil sample by pycnometer	Trainee will be able to: - Identify pycnometer apparatus - Assemble apparatus with soil sample - Record observations - Evaluate specific gravity using formula	- Define Soil structure and enlist its group - Define specific gravity - Define pycnometer Practical activity: - Determine specific gravity of soil sample - State the formula of specific gravity	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Pycnometer of about 1 liter capacity	Class room and lab
LU5. Evaluate specific gravity of soil sample by density bottle	Trainee will be able to: - Identify density bottle - Assemble apparatus with soil sample - Evaluate specific gravity using formula	- Define three phase diagram of soil - Enlist objectives of soil mechanics Practical activity: - Measure specific gravity of soil sample by density bottle method	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Density bottle Oven Weighing balance	Class room and lab
LU6. Perform Sieve Analysis test	Trainee will be able to: - Identify sieves sizes - Assemble nest of sieves - Prepare soil sample - Conduct soil sample shaking - Record observation of weights - Evaluate results of percentage passing	- Enlist physical properties of soil - Define sieve analysis test - Identify sieve sizes - State Atterberg limit of soil Practical activity: - Calculate the size distribution of soil - Calculate the percentage passing	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Sieve brushes Ultrasonic cleaners Sieving equipment	Class room and lab



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LU7. Execute Hydrometer test for fine soil	Trainee will be able to: • Identify apparatus • Evaluate soil fraction passing sieve#200 • Prepare soil sample • Identify chemical • Conduct hydrometer test • Evaluate results for data collected from observations	• Define hydrometer • Define fine soil • Explain classification of soil • State the use of soil hydrometer Practical activity: • Calculate the size of soil particles by hydrometer test' • Calculate soil fraction passing sieve#200	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Hydrometer Sieve#200 Calcium carbide reagent	Class room and lab
LU8. Draw gradation curve form analysis results	Trainee will be able to • Identify results from analysis. • Draw semi log scale graph • Plot grain size vs percentage passing of soil sample • Interpret soil type graphically	• Explain different types of densities • Define gradation curve • State the grades of soil • State the methods of soil gradation Practical activity: • Calculate the gradation of soil • Interpret soil type graphically	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	Log graph Pencil Rubber Calculator Scale	Class room and lab



11.9.2 Determine Atterberg's Limits

Objective: This module covers the skills and knowledge required to determine liquid limit of soil, plastic limit of soil and shrinkage limit of soil

Duration: 12 Hours

Theory: 3 Hours

Practice: 09 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Determine liquid limit of soil	Trainee will be able to: - Identify apparatus - Prepare soil sample - Assemble soil sample in apparatus - Cut groove in sample - Record number of blows - Repeat soil sample trials by varying moisture content - Interpret no. of blows and water content graphically	- Define soil - Define consistency of soil - Define liquid limit of soil - State the importance of liquid limit Practical activity: - Calculate the liquid limit of soil - Interpret the liquid limit graphically	Theory-1Hrs Practice-2Hrs Total- 3Hrs	Empty clean container Moist Sample Oven Balance accurate to 0.01gm	Class room and lab
LU2. Determine plastic limit of soil	Trainee will be able to: - Identify apparatus - Prepare soil sample - Roll treads of soil with fingers - Complete Rolling and kneading of soil samples - Dry crumbled soil threads in oven	- Define plastic limit of soil - Define plasticity index - Define liquidity index - Define consistency index - Define importance of plastic limit of soil Practical activity:	Theory-1Hrs Practice-2.5Hrs Total-.3.5Hrs	Empty clean container Moist Sample Oven Balance accurate to 0.01gm	Class room and lab



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	Evaluate soil water content	- Calculate the plastic limit of soil - Calculate the soil water content			
LU3. Determine shrinkage limit of soil	Trainee will be able to: - Identify apparatus - Prepare soil sample - Evaluate volume of wet soil - Evaluate weight of wet soil - Evaluate volume of dry soil after soil shrinkage - Evaluate weight of dry soil after soil shrinkage - Identify shrinkage limit formula	- Define shrinkage limit - State the importance of shrinkage limit - Define Atterberg's limit - Explain methods to determine Atterberg's limits Practical activity: - Calculate the shrinkage limit of soil - Calculate the degree of saturation at shrinkage limit	Theory-1Hrs Practice-2.5Hrs Total- 3.5Hrs	Empty clean container Moist Sample Oven Balance accurate to 0.01gm	Class room and lab
LU4. Maintain Safe work environment	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage.	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	lab



11.9.3 Classify Soils

Objective: This module covers the skills and knowledge required to perform Sieve analysis for soil sample, execute hydrometer test for fine soil, draft gradation curve Classify soil by AASHTO classification chart, Classify soil by USCS tables and Classify soil according to textural formation

Duration: 15 Hours

Theory: 3 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare to classify soil samples	Trainee will be able to: - Review job request and any accompanying documentation to identify purpose of soil classification and client's information needs - Identify any hazards and relevant safe work procedures associated with the types of site samples - Inspect supplied samples and test data, compare with specifications and record and report any discrepancies - Liaise with client when supplied samples, test data and/or job request forms do not comply with workplace procedures and resolve any problems - Assemble required	- Define soil - State classification of soil - Define types of soil - Explain hazards and relevant safe work procedures associated with the types of site samples - Explain particle size classification system Practical activity: - Identify the hazards - Calculate and prepare all the test data - Compare the results with specifications	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200 lid and pan Balance sensitive to 0.1gm Sieve shaker Soft brush for cleaning	Class room and lab



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	equipment/materials and check that they are fit for purpose				
LU2. Examine properties of soil samples	Trainee will be able to: - Assess appearance and feel of soil to determine moisture condition - Use moulding/indentation tests, penetrometer and/or density index data to determine soil consistency - Identify the soil's major, secondary and minor components and the proportion of each - Assign a soil colour based on own observations and review of field log sheets - Determine soil structure based on own observations and review of available zoning, defect and cementing data recorded for undisturbed field samples - Review any additional observations and test data that may identify soil	- Define properties of soil - Explain well graded, uniformly graded soil, poorly graded soil, Effective grain size, coefficient of uniformity, coefficient of curvature Practical activity: - Determine the soil consistency - Identify the soil components - Determine soil structure based on recorded data - Identify the origin of soil	Theory-0.5Hrs Practice-3Hrs Total-.3.5Hrs	Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200 lid and pan Balance sensitive to 0.1gm Sieve shaker Soft brush for cleaning	Class room and lab



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	origin				
LU3. Analyse available test results	Trainee will be able to: • Compare supplied mechanical test data with standard classification values for different soil types • Compare particle size and percentage composition data with standard classification values for different soil types • Compare other laboratory test results with own observations to confirm assignment of plasticity, grading and strength of soil samples • Recognise anomalies or unexpected results and, if necessary, recheck specimens and test results and conduct repeat tests to ensure reliable results	• Define mechanical test data • Explain the particle size analysis for different soils. • Define plasticity • Explain the strength and grading of soil Practical activity: • Calculate the percentage values for different soil types • Compare the result to find plasticity and grading of soil samples	Theory-0.5Hrs Practice-2Hrs Total- 2.5Hrs	Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200 lid and pan Balance sensitive to 0.1gm Sieve shaker Soft brush for cleaning	Class room and lab
LU4. Record soil classification.	Trainee will be able to: • Use standard symbols and descriptors to assign a valid soil classification by AASHTO charts, USCS table, and	• Explain Textural classification system • Define AASHTO (American Association of State Highway	Theory-0.5Hrs Practice-2Hrs Total- 2.5Hrs	AASHTO charts USCS table	Class room and lab



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	textural formation - Record and store client's soil classification, samples and test data in accordance with workplace procedures - Maintain confidentiality of client information in accordance with workplace procedures	and Transportation Officials) soil classification system - Define Unified soil classification system Practical activity: - Record and store soil classification			
LU5. Maintain Safe work environment	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage.	- Explain safe work procedures - Explain importance of recycle or dispose of waste in accordance with workplace procedures Practical activity: - Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0.5Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	Lab



11.9.4 Conduct soil compaction tests in field

Objective: This module covers the skills and knowledge required to Conduct Standard Proctor test, conduct modified Proctor test, inspect field density by core cutter and inspect soil field density by Sand replacement method

Duration: 15 Hours

Theory: 3 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare the site to conduct core cutter test.	Trainee will be able to: - Clear the site to conduct core cutter test. - Conduct site leveling as per standards.	- Define compaction - Define different types of compaction - Define leveling - Enlist the principles of compaction - Define consolidation - Define core cutter test - Enlist the steps of core cutter test Practical activity: - Inspect and analyze cleanliness of site	Theory-1Hrs Practice-2Hrs Total- 3Hrs	tools for excavating hole clean dry sand passing from No.10 (2.0mm) sand retained on No.20 (850µm) sieve Speedy moisture tester apparatus.	Class room and lab
LU2. Setup the apparatus to conduct core cutter test.	Trainee will be able to: - Arrange the core cutter. - Check the set-up position.	- Define apparatus of core cutter test - Explain comparison between consolidation and compaction - State the type of soil used for core cutter	Theory-0.5Hrs Practice-2Hrs Total-.2.5Hrs	Apparatus Standard proctor mould rammer of 2.5Kg (5.5 lb) of fall 25.4Cm (12") Apparatus Core cutter	Class room and lab



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		method Practical activity: Inspect and analyze the setup of apparatus			
LU3. Conduct the core cutter test	Trainee will be able to: - Apply the blows using standard hammer. - Take out the core cutter. - Extrude the core of soil - Note down the readings-weights	- Describe the core cutter test - Describe compaction effort or energy - State the volume of core cutter - State the code for core cutter test of soil Practical activity: - Measure the readings	Theory-0.5Hrs Practice-2Hrs Total- 2.5Hrs	Hammer excavating tools oven Sand bottle	Class room and lab
LU4. Determine moisture contents	Trainee will be able to: - Collect sample from the core as per standards. - Find out moisture contents of the sample	- Define collection of sample from the core - Define moisture content - State formula for moisture content Practical activity: - Determine the moisture content	Theory-0.5Hrs Practice-2Hrs Total- 2.5Hrs	Balance moisture container straight edge	Class room and lab



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LU5. Evaluate the Results	Trainee will be able to: - Sequence the data. - Calculate the bulk density. - Calculate the dry density. - Compare the results with the standards.	- Define bulk density - State formula to determine bulk density - Define dry density Practical activity: - Measure the bulk density - Measure the dry density - Compare the results with standards	Theory-0.5Hrs Practice-2Hrs Total- 2.5Hrs	Balance oven straight edge container	Class room and lab
LU6. Maintain Safe work	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage.	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	lab



11.9.5 Conduct soil compaction tests in lab

Objective: This module covers the skills and knowledge required to Conduct Standard Proctor test, conduct modified Proctor test.

Duration: 19 Hours

Theory: 3 Hours

Practice: 16 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare samples to conduct standard Proctor test	Trainee will be able to: - Collect soil from source. - Reduce the sample for standard test as per standards. - Add decided water in soil sample for standard test	- Define compaction - Enlist the principles of compaction - Define consolidation - Define standard proctor test - Enlist the steps of proctor test Practical activity: - Prepare the samples to conduct standard proctor test	Theory-1Hrs Practice-3.5Hrs Total- 4.5Hrs	Apparatus Standard proctor mould sieve 19 mm (3/4") and 9.5mm (3/8") calibrating container	Class room and lab
LU2. Conduct standard Proctor test	Trainee will be able to: - Set up proctor test apparatus - Measure weights during conduction of standard test. - Apply comp active efforts as per requirements in 3 layers - Inspect compacted specimen of standard test. - Extract sample for moisture	- Differentiate between compaction and consolidation. - Define compacted specimen of standard test. - Define moisture content - State the difference between standard proctor test and modified proctor test Practical activity: - Measure the weights	Theory-0.5Hrs Practice-3.5Hrs Total-4Hrs	Balance Tray Hammer tools oven calibrating container glass plate	Class room and lab



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	contents for standard test. - Find out the moisture contents for standard test - Evaluate bulk density of soil for standard test - Evaluate dry density of compacted soil for standard test - Interpret water content and dry density graphically	during conduction - Inspect compacted specimen - Extract the sample for moisture content - Measure bulk density and dry density			
LU3. Prepare samples to conduct modified Proctor test	Trainee will be able to: - Collect soil from source. - Reduce the sample for modified test as per standards. - Add decided water in soil sample for modified test.	- Define soil sources - Define Compaction Effort or Energy. - State the factors affecting compaction. Practical activity: - Identify the source of soil - Interpret the water content and dry density graphically	Theory-0.5Hrs Practice-3.5Hrs Total- 4Hrs	Balance Tray Hammer tools oven calibrating container glass plate	Class room and lab
LU4. Conduct modified Proctor test	Trainee will be able to: - Set up modified proctor test apparatus - Measure weights during conduction of s modified test. - Apply comp active efforts as per requirements in 3 layers	- Explain the procedure of standard proctor test - Explain the procedure of modified compaction test. - Define bulk density - Define dry density of compacted soil	Theory-1Hrs Practice-3.5Hrs Total- 4.5Hrs	Balance Tray Hammer tools oven calibrating container glass plate	Class room and lab



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	- Inspect compacted specimen of modified test. - Extract sample for moisture contents for modified test. - Find out the moisture contents for modified test - Evaluate bulk density of soil for modified test - Evaluate dry density of compacted soil for modified test - Interpret water content and dry density graphically	for modified test - Define moisture content Practical activity: - Measure weights during conduction - Measure the bulk density for modified test - Measure the moisture content for modified test - Measure the dry density for modified test - Interpret the water content and dry density graphically for modified test			
LU5. Maintain Safety work requirement	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage.	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	lab



11.9.6 Determine permeability of soil

Objective: This module covers the skills and knowledge of permeability constant head method and permeability falling head method

Duration: 34 Hours

Theory: 4 Hours

Practice: 30 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare specimen to conduct permeability by constant head method	Trainee will be able to: - Collect the soil from source. - Prepare the specimen for permeability test.	- Define permeability - Explain constant head method - State the use of permeability - Enlist factors affecting permeability - Define soil classification Practical activity: - Inspect and analyze preparation of sample and collection of soil	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Constant head Permeameter device 500ml beaker Stop watch	Class room and lab
LU2. Setup the Apparatus to conduct permeability test by Constant head method	Trainee will be able to: - Identify the apparatus for constant head method. - Assemble apparatus. - Place the specimen in constant head permeameter	- Define constant head - Define constant head permeameter - Define darcy's law - State the formula of darcy's law Practical activity: - Inspect and analyze setup of apparatus for permeability test by constant head	Theory-1Hrs Practice-3Hrs Total-.4Hrs	Constant head Permeameter device 500ml beaker Stop watch Thermometer Apparatus Falling/ Variable head Permeameter device Ring stand with	Class room and lab



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		method		test tube clamp Burette (100ml)	
LU3. Perform constant head permeability test	Trainee will be able to: - Identify water head level difference. - Record the observations. - Evaluate permeability of cohesion-less soil	- Enlist lab permeability tests - Enlist field permeability tests Practical activity: - Measure water head level difference - Evaluate permeability	Theory-0.5Hrs Practice-6Hrs Total- 6.5Hrs	Constant head Permeameter device 500ml beaker Stop watch Thermometer Apparatus Falling/ Variable head Permeameter device Ring stand with test tube clamp Burette (100ml)	Class room and lab
LU4. Prepare specimen to conduct permeability by variable head method	Trainee will be able to: - Collect the soil from source. - Prepare the specimen for permeability test.	- Define falling head method - Define variable head method Practical activity: - Inspect the preparation of sample - Collect the soil from source for variable head method	Theory-0.5Hrs Practice-6Hrs Total- 6.5Hrs	Constant head Permeameter device 500ml beaker Stop watch	Class room and lab
LU5. Setup the Apparatus to conduct permeability test by variable head method	Trainee will be able to: - Identify the apparatus for variable head method. - Complete apparatus calibration	- Differentiate between constant and variable head method - Define calibration of apparatus Practical activity:	Theory-0.5Hrs Practice-5Hrs Total- 5.5Hrs	Constant head Permeameter device 500ml beaker Stop watch	Class room and lab



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	- Assemble apparatus. - Place the specimen in variable head permeameter.	Inspect and analyze setup of apparatus for permeability test by variable head method			
LU6. Perform variable head permeability test	Trainee will be able to: - Identify water head level difference. - Record the observations. - Evaluate permeability of cohesive soil	- Define water head level difference - Define cohesive soils Practical activity: - Measure the permeability of cohesive soils	Theory-0.5Hrs Practice-5Hrs Total- 5.5Hrs	Constant head Permeameter device 500ml beaker Stop watch	Class room and lab
LU7. Maintain Safe work environment	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	lab



11.9.7 Determine the shear strength of soil

Objective: This module covers the skills and knowledge required to perform direct shear test and execute triaxial shear test

Duration: 28 Hours

Theory: 4 Hours

Practice: 24Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare specimen to conduct direct shear test	Trainee will be able to: - Collect the soil whether undisturbed or remolded from source for shear test. - Prepare the specimen for shear test.	- Define shear strength of soil - Explain direct shear test - State the importance of shear strength - Define remolded soil Practical activity: - Collect the soil sample from source - Inspect and analyze preparation of specimen	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Base plate with cross grooves on its top Porous stones (2 Nos) Plain Grid plates (2Nos) Perforated grid plates (2Nos) Loading pad with steel ball	Class room and lab
LU2. Setup the Apparatus to conduct direct shear test	Trainee will be able to: - Identify the apparatus for direct shear test. - Assemble direct shear test apparatus - Place the specimen in apparatus	- Describe the types of strength tests on soil - Describe direct shear test apparatus Practical activity: - Check the inner dimensions of container - Calculate the volume of the	Theory-1Hrs Practice-3Hrs Total-.4Hrs	Shear box Shear box container Digital weighing machine Dial gauges (2 Nos) Weights Tampering Rod Spatula	Class room and lab



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		container • Measure the weight of container			
LU3. Perform Direct Shear test	Trainee will be able to: • Apply the load at specified rating against normal stress. • Record the observations. • Repeat as per specs on other specimens against normal stress. • Perform calculations in specified format. • Produce the results graphically • Interpret internal friction angle from graph	• Define Coulomb's law • Define Mohr's circle • Explain the steps of tri axial compression test Practical activity: • Measure the weight of the soil container • Calculate the density of the soil • Measure the thickness of the soil • Calculate the internal friction angle	Theory-0.5Hrs Practice-4Hrs Total- 4.5Hrs	Shear box Shear box container Digital weighing machine Dial gauges (2 Nos) Weights Tampering Rod Spatula Rammer Sampler Distribution Panel	Class room and lab
LU4. Prepare specimen to conduct triaxial shear test	Trainee will be able to: • Collect the soil from source for triaxial shear test. • Prepare the specimen consolidated drained/ consolidated undrained/ un consolidated undrained for triaxial shear test.	• Define unconfined compression test • Define vane shear test • Define simple shear test • Explain triaxial shear test Practical activity: • Collect the soil sample from source • Inspect and analyze preparation of specimen for triaxial shear test	Theory-0.5Hrs Practice-4Hrs Total- 4.5Hrs	Sampler Distribution Panel Automatic Pressure/Volume Controllers Load Frame Load Cell Displacement transducer Tri axial Cell Pore Pressure Transducer De-aired water	Class room and lab



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				supplier Data logger	
LU5. Setup the Apparatus to conduct triaxial shear test	Trainee will be able to: - Identify the apparatus for triaxial shear test. - Assemble triaxial shear test apparatus - Place the specimen in apparatus	- Explain the factors affecting shear strength of soil - Explain triaxial shear test - Differentiate between cohesive and non-cohesive soil Practical activity: - Check the inner dimensions of container - Calculate the volume of the container - Measure the weight of container	Theory-0.5Hrs Practice-4Hrs Total- 4.5Hrs	Sampler Distribution Panel Automatic Pressure/Volume Controllers Load Frame Load Cell Displacement transducer Tri axial Cell Pore Pressure Transducer De-aired water supplier Data logger	Class room and lab
LU6. Execute triaxial Shear test	Trainee will be able to: - Apply the stress as per test condition required - Record the observations. - Produce the results graphically - Interpret cohesion and internal friction angle from graph	- Define internal friction - Define triaxial shear test - Enlist steps of triaxial shear test Practical activity: - Compute the shear strength of soil - Calculate the internal friction angle from the graph - Calculate the final water content	Theory-0.5Hrs Practice-4Hrs Total- 4.5Hrs	Sampler Distribution Panel Automatic Pressure/Volume Controllers Load Frame Load Cell Displacement transducer	Class room and lab



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LU7. Maintain Safe work environment	Trainee will be able to: • Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel • Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures • Clean and check serviceability of test equipment before storage	Practical activity: • Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-2Hrs Total- 2Hrs	Gloves Shoes Glasses Lab coat	lab
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11.9.8 Conduct California Bearing Tests

Objective: This module covers the skills and knowledge to Find bearing capacity of soil using Spt test and Identify bearing capacity using California bearing ratio

Duration: 37 Hours

Theory: 4 Hours

Practice: 33 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare specimen to conduct direct shear test	Trainee will be able to: - Collect the sample for subgrade/ soil, sub-base and base from source for CBR tests. - Prepare the specimen as per requirement for CBR tests in defined layers and number of blows.	- Define direct shear test - Differentiate between direct and simple shear tests - Differentiate between sub grade, sub-base and base soils Practical activity: - Collect the sample from the source - Inspect and analyze preparation of sample	Theory-1Hrs Practice-6Hrs Total- 7Hrs	Mould Steel Cutting collar Spacer Disc Surcharge weight Dial gauges	Class room and lab
LU2. Setup the Apparatus to conduct CBR test	Trainee will be able to: - Identify CBR apparatus - Assemble the apparatus. - Check the assembly adjustments.	- Explain CBR - Define flexible pavement - Define dry density Practical activity: - Measure the amount of soil specimen - Check the sample through 40 sieves	Theory-1Hrs Practice-6Hrs Total-7Hrs	Sieves Penetration Plunger Loading Machine Tripod.	Class room and lab



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LU3. Perform CBR Test	Trainee will be able to: • Apply the load as per standards penetrations for soil. • Record observation data for soil • Place the sub-base layer sample. • Apply the load as per standards penetrations for sub-base layer. • Record observation data for sub-base layer. • Place the base layer sample. • Apply the load as per standards penetrations for base layer. • Record observation data for base layer. • Interpret penetration and penetration load graphically • Evaluate CBR from graph • Interpret percentage CBR and dry density of sample graphically • Identify CBR graphically at required degree of compaction	• Explain the steps of performing CBR test • State the working of CBR apparatus • State percentage CBR and dry density of sample graphically Practical activity: • Calculate moisture content • Calculate dry density • Record the observations • Compute and interpret the results	Theory-1Hrs Practice-9Hrs Total- 10Hrs	detachable perforated base plate Spacer disc Metal rammer Weights. Loading	Class room and lab
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LU4. Design the Flexible Pavement from CBR charts.	Trainee will be able to: - Note the depth of sub-base from CBR chart for evaluated CBR value. - Note the depth of base from CBR chart or evaluated CBR value. - Note the depth of sub-base from CBR chart or evaluated CBR value. - Summarize the depths of layers	- Define CBR chart - Define flexible pavement design - Enlist the types of flexible pavements Practical activity: - Calculate the flexible pavement design - Demonstrate the design of flexible pavement - Compute readings of CBR from graph - Compute readings of dry density from graph	Theory-1Hrs Practice-9Hrs Total- 10Hrs	mixing bowl straight edge scales soaking tank or pan drying oven filter paper Containers.	Class room and lab
LU5. Maintain safe work environment.	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of other personnel - Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures - Clean and check serviceability of test equipment before storage	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and workplace procedures.	Theory-0Hrs Practice-3Hrs Total- 3Hrs	Gloves Shoes Glasses Lab coat	Lab



11.9.9 Find out bearing capacity of soil

Objective: This module covers the skills and knowledge to Find bearing capacity of soil using Spt test and Identify bearing capacity using California bearing ratio

Duration: 36 Hours

Theory: 4 Hours

Practice: 32 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare site to conduct Standard Penetration test	Trainee will be able to: • Perform re connivances to reach at the location for performing SPT. • Conduct site clearance. • Perform grubbing if any required	• Define penetration • Explain penetration test • Define SPT (Standard penetration test) • State the importance of SPT test • Explain bearing capacity of soil • Define grubbing Practical activity: • Select the area for sample • Measure the pipe interval	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Drilling Rig. Split spoon (tube). Drop hammer Driving head (anvil).	Class room and lab
LU2. Setup the Apparatus to conduct SPT.	Trainee will be able to: • Identify SPT apparatus • Assemble the apparatus. • Check the split spoon sampler dimension	• State the factors affecting bearing capacity • State the difference between SPT and CPT Practical activity: • Check the split spoon sampler dimensions	Theory-0.5Hrs Practice-3Hrs Total-3.5Hrs	Guiding rod. Tripod. Extension rods Cylindrical mould	Class room and lab



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LU3. Perform SPT at site.	Trainee will be able to: • Apply the blows of standard weight as per ASTM D 1586. • Countdown the number of blows N_{spt}. • Calculate Normal 60 by standard equation • Calculate the relative density of soil by use of table and relevant equation. • Evaluate bearing capacity	• Explain standard penetration test • Enlist the steps of performing SPT • Define relative density of soil • Describe the relative density of soil by use of table and relevant equation. Practical activity: • Calculate Normal 60 by standard equation • Calculate the relative density of soil by use of table • Evaluate bearing capacity	Theory-0.25Hrs Practice-3Hrs Total- 3.25Hrs	detachable perforated base plate Spacer disc Metal rammer Weights. Loading	Class room and lab
LU4. Prepare site to conduct Plate Bearing test	Trainee will be able to: • Perform re connivance to reach at the location for performing plate bearing test. • Conduct site clearance. • Perform grubbing if any required.	• Explain plate bearing test • State the purpose of plate bearing test • Define grubbing Practical activity: • Measure the depth of test pit • Inspect and analyze performance of plate bearing test	Theory-0.25Hrs Practice-4Hrs Total-4.25 Hrs	Metal penetration piston Two dial gauges reading to 0.01 mm. Sieves. 4.75 mm and 20 mm I.S. Sieves mixing bowl straight edge	Class room and lab



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LU5. Setup the Apparatus to conduct Plate Bearing Test.	Trainee will be able to: - Identify plate bearing test apparatus - Assemble the apparatus.	- Describe the types of penetration tests for soil Practical activity: - Measure the thickness of load bearing plate - Identify the shape of the plate	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	scales soaking tank or pan drying oven filter paper Containers. Plate bearing test apparatus.	Class room and lab
LU6. Perform Plate Bearing Test at site.	Trainee will be able to: - Note the size of plates used as per ASTM D 1194. - Apply the load as per available resources. - Record the observations to determine stress as per requirements. - Evaluate the bearing capacity of soil.	- Define ASTM D 1194 Practical activity: - Evaluate bearing capacity of soil from plate load test - Draw the load-settlement curve - Evaluate the ultimate load for the plate from the graph	Theory-0.25Hrs Practice-4Hrs Total- 4.25Hrs	scales soaking tank or pan drying oven filter paper Containers. Plate bearing test apparatus.	Class room and lab
LU7. Prepare sample to conduct CBR test	Trainee will be able to: - Collect the sample for soil, from source for CBR tests. - Prepare the specimen as per requirement for CBR tests in defined layers and number of blows.	- Define soil sample - Define California bearing ratio test - Define cone penetration test Practical activity: - Inspect and analyze the performance of CBR test	Theory-0.25Hrs Practice-3Hrs Total- 3.25Hrs	scales soaking tank or pan drying oven filter paper Containers. Plate bearing test apparatus.	Class room and lab



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LU8. Setup the Apparatus to conduct CBR Test.	Trainee will be able to: - Identify CBR apparatus - Assemble the apparatus. - Check the assembly adjustments.	- Describe CBR test apparatus - Define dilatometer - Explain scala test Practical activity: - Measure the amount of soil specimen - Check the sample through 40 sieve	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	scales soaking tank or pan drying oven filter paper Containers. Plate bearing test apparatus.	Class room and lab
LU9. Identify bearing capacity using California bearing ratio test	Trainee will be able to: - Place the soil/ subgrade sample. - Apply the load as per standards penetrations for soil. - Record observation data for soil - Interpret penetration and penetration load graphically - Evaluate CBR from graph - Interpret percentage CBR and dry density of sample graphically - Identify CBR graphically at required degree of compaction	- Differentiate between field and laboratory test - Define CBR graphically at required degree of compaction Practical activity: - Calculate moisture content - Calculate dry density - Record the observations - Compute and interpret the results - Evaluate CBR from graph	Theory-0.5Hrs Practice-3Hrs Total- 3.5Hrs	scales soaking tank or pan drying oven filter paper Containers. Plate bearing test apparatus.	Class room and lab
LU10. Maintain safe work environment	Trainee will be able to: Use safe work procedures and personal protective equipment (PPE) to ensure personal safety	Practical activity: Perform collection and disposal of waste material in accordance with environmental requirement and	Theory-0Hrs Practice-3Hrs Total- 3Hrs	Gloves Shoes Glasses Lab coat	Lab



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	and that of other personnel • Clean work area and collect, recycle or dispose of all waste in accordance with workplace procedures • Clean and check serviceability of test equipment before storage	workplace procedures.			
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11.10. Concrete Technology

11.10.1 Test the Properties of Fresh Concrete

Objective: This module covers the skills and knowledge required to perform the Slump Test, perform the Compacting Factor Test and supervise the concrete pouring on site

Duration: 27Hours

Theory: 6 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform the Slump Test	Trainee must be able to - Collect samples from a desired batch of concrete - Prepare the Samples as per standard guidelines - Select the appropriate apparatus as per requirements - Apply PPEs - Carry out the testing procedure as per standard guidelines of ASTM C-143 - Compute the results of the test - Prepare the test record sheet	- Explain Ingredients of Concrete. - Explain difference between good and bad concrete. - State the different recommended values of slumps for various conditions of placements. Practical activity Perform slum test on concrete (1:2:4) and (1:3:6) having w/c of 1:6 in lab.	Theory-3Hrs Practice-7Hrs Total- 10Hrs	Concrete Drum Mixer Platform scale Slump Test Apparatus Mechanical Sieve Shaker Wheel Barrow Bucket Straight Edge Shovels with handle Spirit Level Mortar Pan Mixing Spoon Set Weigh balance Straight Edge Metallic Tape	Class room and lab
LU2. Perform the Compacting Factor	Trainee will be able to:	Explain the factor	Theory-2Hrs	Compacting Factor Apparatus	Class



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Test	- Identify the apparatus. - Pour the concrete mix in Hooper's in proper sequence. - Weigh the concrete. - Fill the cylinder in specified layers - Weigh compacted concrete. - Calculate the compacting factor by using formula.	influencing concrete properties State different factors affecting the workability of concrete. Practical activity Perform the Compacting Factor Test on (1:2:4) and (1:3:6) having w/c of 1:6 concrete in lab.	Practice-7Hrs Total-9Hrs	Concrete Drum Mixer Platform scale Mechanical Sieve Shaker Wheel Barrow Bucket Straight Edge Shovels with handle Spirit Level Mortar Pan Mixing Spoon Set Weigh balance Straight Edge Metallic Tape	room and lab
LU3. Supervise the concrete pouring on site	Trainee will be able to: - Check the temperature of the concrete - Inspect the structure to be concreted - Inspect the slump test values - Inspect the form work - Inspect the Bore Hole Depth as required - Check the length of concrete	Explain different methods of mix design, transportation of fresh concrete it's placing and compaction. Practical activity Supervise the lean concrete (1:4:8) having w/c of 1:6 pouring in column and beam formwork in lab.	Theory-1Hrs Practice-7Hrs Total-8 Hrs	Thermometer Record sheet	Class room and lab



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	pouring pipes • Check the workability of concrete pump • Monitor the concreting procedure • Maintain the concrete record sheet				
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11.10.2 Perform the Quality Tests on Fine Aggregates for Concrete

Objective: This module covers the skills and knowledge required to perform the Gradation Test, perform the organic impurities test, perform the Sand equivalent test and Compute the Specific Gravity, Unit Weight and OMC

Duration: 16Hours

Theory: 4 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform the Gradation Test	Trainee will be able to: - Prepare the Samples as per standard guidelines - Select the appropriate Sieve Set as per requirements - Apply PPEs - Carry out the sieving procedure as per standard guidelines of AASHTO T-27 & ASTM C-125 - Compute the results of the test - Compute the Fineness Modulus - Prepare the test record sheet	- Describe the gradation techniques - NHA Specifications Manual 1998, American Association of State Highways and Transportation Officials (AASHTO) Manual M, R & ASTM Manuals - Define fineness modulus - Define PPPEs Practical activity Perform the sieve analysis, calculate fineness and identify type of aggregate on ravi and Lawrence pure sand in lab.	Theory-2Hrs Practice-4Hrs Total-6Hrs	Sieve Set Weighing balance Brush Container	Class room and lab
LU2. Perform the organic impurities test	Trainee will be able to: - Prepare the Samples as per standard guidelines - Select the appropriate Sieve Set as	- Describe the AASHTO Specifications for the test. - Define organic materials.	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	Graduated Cylinder Sodium Sulphate	Class room and lab



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	per requirements • Apply PPEs • Carry out the testing procedure as per standard guidelines of AASHTO T-21 • Compute the results of the test • Prepare the test record sheet	Practical activity Perform the organic impurities test on Ravi and Lawrencepur sand in lab.			
LU3. Perform the Sand equivalent test	Trainee will be able to: • Prepare the Samples as per standard guidelines • Select the appropriate Sieve Set as per requirements • Apply PPEs • Carry out the testing procedure as per standard guidelines of AASHTO T-176 • Compute the results of the test • Prepare the test record sheet	• Describe the AASHTO Specifications for the test. Practical activity Perform the Sand equivalent test on ravi and Lawrencebur sand in lab.	Theory-0.5Hrs Practice-3Hrs Total-3.5 Hrs	pouring cylinder calibration container tray	Class room and lab
LU4. Compute the Specific Gravity and Unit Weight	Trainee will be able to: • Prepare the Samples as per standard guidelines • Select the appropriate Sieve Set as	• Define specific gravity, unit weight • Describe the AASHTO Specifications for the test. Practical activity	Theory-1Hrs Practice-3Hrs Total-4 Hrs	Pycnometer Oven	



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	per requirements • Apply PPEs • Carry out the testing procedure as per standard guidelines of AASHTO T-99 & T-180 • Compute the results of the test • Prepare the test record sheet	Compute the Specific Gravity, and Unit Weight of ravi and lawrencepur sand in lab.			
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11.10.3 Perform Quality tests on Coarse Aggregates for Concrete Mix Design

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform the Gradation Test, Compute the Specific Gravity, Unit weight and Optimum Moisture content of the aggregate, Carry out Clay Lumps and Friable Particles Test, Perform the Soundness Test , Perform Flaky & Elongated Particles test , Perform the Los Angeles Abrasion Test for A & B class Material, Perform the Aggregate Impact Value Test and Execute the Aggregate Crushing Value Test.

Duration: 24Hours

Theory: 6 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Samples for Petrography	Trainee will be able to: • Select the quarry Site • Classify the quarry site as guided • Sketch a paper map of the quarry site • Collect the fresh sample from the quarry site • Transport the sample to the laboratory • Prepare the Fresh Samples as per standard guidelines • Handover the Samples for preparation of Thin Section Slides • Ensure the safety of the samples	• Define the Aggregates • State classification of aggregates according to nature of formation, size and shape • Explain quarry • Explain the procedures of Petrography and its importance Practical activity Prepare aggregate Samples for Petrography in lab.	Theory-1.5Hrs Practice-2Hrs Total-3.5Hrs	• PPEs • File • Shovel	Class room and lab



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LU2. Perform the Gradation Test	• Prepare the Samples as per standard guidelines • Select the appropriate Sieve Set as per requirements • Apply PPEs • Carry out the sieving procedure as per standard guidelines of AASHTO T-27 • Compute the results of the test • Prepare the test record sheet	• State the characteristics of good fine and coarse aggregates • Explain the fine aggregates (Fineness, impurities) and on coarse aggregates (sieve analysis, Flakiness, elongation and Specific gravity). • Explain the AASHTO, ASTM and IS standards for AASHTO T-27, ASTM C127, AASHTO T-112, AASHTO T-104, ASTM D-4791-95, AASHTO T-96, ASTM C-131/C-131M, IS-2386-4 • Define importance of gradation of aggregates. • Explain the importance of blending process of coarse aggregates Practical activity Perform the sieve analysis, calculate fineness and identify type of aggregate on coarse aggregate (margalla) in lab.	Theory-1Hrs Practice-2Hrs Total-3Hrs	• Sieve Set • PPEs • File with record sheet • Shovel • Weighing balance • Container • Brush	Class room and lab
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LU3. Compute the Specific Gravity, Unit weight of the aggregate	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of ASTM C127 • Compute the results of the test • Prepare the test record sheet	• Explain the effects of bulking of sand. • Describe the test procedures for Optimum moisture content, Specific Gravity & Unit weight Practical activity Compute the Specific Gravity, Unit weight of the coarse aggregate (margalla crush) in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5 Hrs	• PPEs • File • Shovel • Oven • Wire bucket • Plastic bucket • Weighing balance • Test apparatus • Container	Class room and lab
LU4. Carry out Clay Lumps and Friable Particles Test	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of AASHTO T-112 • Compute the results of the test • Prepare the test record sheet	• Describe the AASHTO Specifications for the test. Practical activity Carry out Clay Lumps and Friable Particles Test on coarse aggregate (margalla crush) in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5 Hrs	• Weighing balance • Container • Sieve set • Oven	Class room and lab



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LU5. Perform the Soundness Test	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of AASHTO T-104 • Compute the results of the test • Prepare the test record sheet	• Describe the test procedures for Soundness Test • Define soundness of aggregate. • Explain the wearing properties of aggregate. Practical activity • Perform the Soundness Test on coarse aggregate (margalla crush) in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	• Weighing balance • Container • Sieve set • Oven • Wire mesh basket • Chemical solution (sodium sulphate, magnesium sulphate)	Class room and lab
LU6. Perform Flaky & Elongated Particles test	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of ASTM D-4791-95 • Compute the results of the test • Prepare the test record sheet	• Define flakiness and elongation index. • Describe the AASHTO Specifications for the test. • Explain the importance of test for road construction. Practical activity • Perform Flaky & Elongated Particles test on margalla crush in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	• Length gauge • Thickness gauge • Oven • Weighing balance	Class room and lab



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LU7. Perform the Los Angeles Abrasion Test for A & B class Material	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of AASHTO T-96 • Compute the results of the test • Prepare the test record sheet	• Define the Abrasion and explain the process of Los Angeles Abrasion Test • Explain the importance of abrasion resistance. Practical activity • Perform the Los Angeles Abrasion Test for A & B class Material in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	• Los Angeles Abrasion Machine • Spherical Steel balls • Weighing balance	Class room and lab
LU8. Perform the Aggregate Impact Value Test	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of ASTM C-131/C-131M • Compute the results of the test • Prepare the test record sheet	• Describe the test procedures for Aggregate impact Value Tests • Define aggregate impact value. Practical activity • Perform the Aggregate Impact Value Test on coarse aggregate (margalla crush) in lab	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	• Tempering Rod • Cylinder • Weighing balance • Impact value apparatus • Sieve set	Class room and lab



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LU9. Execute the Aggregate Crushing Value Test	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of IS- 2386-4 • Compute the results of the test • Prepare the test record sheet	• Describe the test procedures for Aggregate Crushing value • Define aggregate crushing value. Practical activity • Execute the Aggregate Crushing Value Test on coarse aggregate (margalla crush) in lab	Theory-0.5Hrs Practice-2Hrs Total-2.5Hrs	• Hollow cylinder • Base plate • Cylinder • Temping rod • Compression machine • Plunger • Sieve shaker • Sieve set • Weighing balance	Class room and lab
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11.10.4 Perform quality tests for Cement

Objective: This module covers the skills and knowledge required to Check fineness of cement, Prepare cement paste of standard consistence Test, Find out Initial setting time, Find out final setting time, Find soundness of cement, Find compressive strength of cement and Find tensile strength of cement with Briquette test

Duration: 30Hours

Theory: 6 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Check fineness of cement	Trainee will be able to: - Take standard weight of cement sample - Sieve the sample on standard sieve. - Weigh residue retained - Find fineness as per standard Guidelines of ASTM C-786	- Explain the properties of Cement - Explain the types of cement. - Explain the effects of strength due to variance in quantity in cement - Define fineness of cement Practical activity Check fineness of ordinary Portland cement of two brands in lab.	Theory-2Hrs Practice-3Hrs Total-5Hrs	PPEs File BS-170 Sieve Sieve shaker Digital Balance GI Tray Spatula	Class room and lab
LU2. Prepare cement paste of standard consistence Test	Trainee will be able to: - Identify the apparatus - Clean the tools - Weigh cement sample - Prepare cement paste and fill moulds.	- Explain the various properties of cement - Define consistency of cement. - Explain test procedure.	Theory-1Hrs Practice-3Hrs Total-4Hrs	PPEs File with record sheet Shovel Vicat Apparatus. Digital	Class room and lab



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	- Place the mould under Vicat apparatus. - Adjust zero reading - Drop the plunger and note reading till final value - Record the value of consistence	Practical activity Prepare cement paste of standard consistence Test on ordinary Portland cement with two w/c 1:3 and 1:5 in lab.		Balance GI Tray Spatula Knife edge Digital Stop Watch	
LU3. Find out Initial setting time	Trainee will be able to: - Weigh cement sample - Prepare paste of cement. - Start the stop watch. - Fill the molds - Put the mold under vicat apparatus. - Drop the needle and note reading till final value is attained. - Record initial setting time.	- Explain the role of chemicals in setting process - Define initial and final setting time of cement. Practical activity Find out Initial setting time on ordinary Portland cement with two w/c 1:3 and 1:5 in lab.	Theory-0.5Hrs Practice-3Hrs Total-3.5 Hrs	PPEs File with record sheet Shovel Vicat Apparatus. Digital Balance GI Tray Spatula Knife edge Digital Stop Watch	Class room and lab
LU4. Find out final setting time	Trainee will be able to: - Replace the needle with the needle having circular attachment - Note the time when needle leave the impression only. Record final setting time	Explain the test procedure for initial and final setting time. Practical activity Find out final setting time on ordinary Portland cement with two w/c 1:3 and 1:5 in lab.	Theory-0.5Hrs Practice-2Hrs Total-2.5 Hrs	PPEs File with record sheet Shovel Vicat Apparatus. Digital Balance GI Tray	Class room and lab



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				Spatula Knife edge Digital Stop Watch	
LU5. Find soundness of cement	Trainee will be able to: - Take sample. - Make paste with standard %age of water. - Fill the split cylinder in specified manner. - Measure distance between legs of apparatus after 24 hrs. - Put the sample in water and boil it for 3 hrs. - Find soundness by formula	- Describe the test procedures for Soundness Test - Define soundness of cement Practical activity - Find soundness of cement on ordinary Portland cement with two w/c 1:3 and 1:5 test in lab.	Theory-0.5Hrs Practice-4Hrs Total-4.5Hrs	Le-chatlier Apparatus. Digital Balance Glass plate Spatula Knife edge Oven	Class room and lab
LU6. Find compressive strength of cement	Trainee will be able to: - Measure the cement and sand by weight. - Mix the material thoroughly. - Add specified %age of water - Mix it for specific time. - Fill cube mold in specific manner. - Place the sample in atmosphere for	Explain the durability parameters of cement. Practical activity Find compressive strength of ordinary Portland cement with two w/c 1:3 and 1:5 in lab.	Theory-1Hrs Practice-5Hrs Total-5Hrs	Weighing balance Compression testing machine/ UTM PPEs	Class room and lab



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	specific time and then dip in fresh water. • Test the samples after 3,7, and 14 days • Record readings. • Plot the graph.				
LU7. Find tensile strength of cement with Briquette test	Trainee will be able to: • Prepare cement paste with standard quantities. • Fill the molds for 3 and 7 days. • Perform test on samples. • Record readings. • Plot the graph.	• Define the tensile strength and explain the process of test • Explain the importance of tensile strength. Practical activity • Find tensile strength of ordinary Portland cement with two w/c 1:3 and 1:5 with Briquette test in lab.	Theory-0.5Hrs Practice-4Hrs Total-4.5Hrs	Briquet Apparatus. Briquet Mold Digital Balance GI Tray	Class room and lab



11.10.5 Perform Destructive Tests on Hardened Concrete

Objective: This module covers the skills and knowledge required to Calculate compressive strength of concrete (1:2:4) using cubes and cylinder, Perform modulus of rupture test on standard size beams and Perform Split cylinder test

Duration: 30Hours

Theory: 6 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Calculate compressive strength of concrete (1:2:4) using cubes and cylinders	Trainee will be able to: - Measure the cement and sand by weight. - Mix the material thoroughly. - Add specified %age of water - Fill mold in specific manner. - Place the sample in atmosphere for specific time, then dip in fresh water. - Test the samples after 3,7,14, and 28 days - Record readings. - Plot the graph.	- Explain Ingredients of Concrete - Explain difference between good and bad concrete. - Explain the factor influencing concrete properties - State different factors affecting the workability of concrete. - State the different recommended values of slumps for various conditions of placements. - Describe the compressive strength of cube and Cylinder, - Explain different methods of mix design, transportation of fresh concrete its placing and compaction. Practical activity	Theory-4Hrs Practice-8Hrs Total-12Hrs	PPEs File Concrete Drum Mixer Platform scale Molds 4", "Concrete cylinder 6" diameter Vibrating Table Wheel Barrow Bucket Straight Edge Shovels with handle Spirit Level Mortar Pan	Class room and lab



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		Calculate compressive strength of concrete (1:2:4) having w/c of 1:6 and 1:5 using cubes and cylinders in lab.			
LU2. Perform modulus of rupture test on standard size beams.	Trainee will be able to: - Prepare the sample of concrete beam as per specification - Place the specimen on loading points. - Apply load at a constant rate. - Measure the cross section of the tested specimen at each end and at center to calculate average depth and height. - Calculate Flexural strength by using formula.	- Explain the Tensile strength (split cylinder test), and Flexural strength (Beam test), - Describe non-destructive tests - Explain the importance of modulus of rupture. - Explain the procedure of modulus of rupture test. Practical activity - Perform modulus of rupture test on standard size beams with normal concrete and lean concrete in lab.	Theory-1Hrs Practice-8Hrs Total-9Hrs	PPEs File with record sheet Concrete Drum Mixer Platform scale Beam Molds Vibrating Table Wheel Barrow Bucket	Class room and lab
LU3. Perform Split cylinder test	Trainee will be able to: - Prepare the sample of concrete cylinder as per specifications. - Record the weight and dimensions of sample. - Place the specimen on compression testing machine	- Explain the importance of split tensile strength - Explain the procedure of split tensile strength. Practical activity - Perform Split cylinder test on 1:2:4 and 1:4:8 having w/c of 1:6 concrete	Theory-1Hrs Practice-8Hrs Total-9 Hrs	PPEs File with record sheet Concrete Drum Mixer Platform scale Concrete cylinder 6"	Class room and lab



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	With ply wood strips above and below. • Apply the continuous load within the range of 0.72 to 1.4 Mpa / Min. • Observe the failure pattern • Record the Flexural strength.	cylinders in lab.		diameter Vibrating Table	
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11.10.6 Perform Evaluate Concrete Mix Design

Objective: This module covers the skills and knowledge required to Perform quality tests over coarse aggregate, Perform the quality tests over fine aggregates, Perform the quality tests over Cement, Perform quality tests on water and Prepare Trial batch of concrete mix design

Duration: 36Hours

Theory: 4 Hours

Practice: 32 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform quality tests over coarse aggregate	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Arrange Apparatus as per requirements - Apply PPEs - Ensure the workability of the apparatuses - Conduct the test as per standard specifications of AASHTO, ASTM - Compute the results of the test - Prepare the test record sheet	- Explain the working of Concrete mixer machine (Automatic and Manual) - Explain different quality tests carried out for concrete Mix design Practical activity Perform sieve analysis, compaction factor, impact value and moisture content test over coarse aggregate (margalla crush) in lab.	Theory-2Hrs Practice-7Hrs Total-9Hrs	File PPEs Digital Balance GI Tray Spatula Test equipment Digital Stop Watch	Class room and lab
LU2. Perform the quality tests over fine aggregates	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Arrange Apparatus as per requirements	Explain test procedure for aggregate test. Practical activity Perform the sieve analysis, moisture content, specific	Theory-0.5Hrs Practice-8Hrs Total-8.5Hrs	File with record sheet PPEs GI Tray Spatula Test	Class room and lab



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	• Apply PPEs • Ensure the workability of the apparatuses • Conduct the test as per standard specifications of AASHTO, ASTM • Compute the results of the test • Prepare the test record sheets	gravity, organic materials tests over fine aggregates (ravi sand) in lab.		equipment Digital Stop Watch	
LU3. Perform the quality tests over Cement	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Arrange Apparatus as per requirements • Apply PPEs • Ensure the workability of the apparatuses • Conduct the test as per standard specifications of AASHTO, ASTM • Compute the results of the test • Prepare the test record sheets	• Explain different quality test and procedures Practical activity Perform the fineness, initial and final setting time, compressive strength tests over Cement in lab.	Theory-0.5Hrs Practice-6Hrs Total-6.5 Hrs	PPEs File with record sheet Digital Balance GI Tray Spatula Knife edge Test equipment Digital Stop Watch	Class room and lab



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LU4. Perform quality tests on water	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Arrange Apparatus as per requirements • Apply PPEs • Ensure the workability of the apparatuses • Conduct the PH and other tests • Compute the results of the test • Prepare the test record sheets	• Explain the test procedure for water testing. Practical activity Perform pH, turbidity, total solids, nitrates and alkalinity test on tap water in lab.	Theory-0.5Hrs Practice-5Hrs Total-5.5 Hrs	PPEs Test equipment Digital Stop Watch	Class room and lab
LU5. Prepare Trial batch of concrete mix design	Trainee will be able to: • Arrange the materials as per the Batching summary sheet • Weigh the desired amounts of materials • Perform test run on the mixture machine • Ensure the workability of the mixer machine • Prepare the concrete mixture • Ensure the standard specifications	• Describe the mixing, transporting and pouring procedure of concrete. • Define concrete mix design. Practical activity • Prepare Trial batch of concrete mix design, check its temperature, formwork and mixing machine condition also calculate slump value and compressive strength on (1:2:4)	Theory-0.5Hrs Practice-6Hrs Total-6.5Hrs	PPEs Multimeter Circuit Diagrams for Plants Digital Balance Digital Thermometer GI Tray Spatula Knife edge Test equipment	Class room and lab



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	during mixing procedure • Perform the Slump test • Fill up the concrete cylinders • Perform concrete compressive strength test for 7 & 28 days • Compute the test results • Fill up the Concrete mix design summary sheet • Prepare the record sheet • Submit the record sheets for approval	and (1:1:2) concrete cubes and cylinders with w/c of 1:6 in lab.		Digital Stop Watch	
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11.11. Water and Waste Water Testing

11.11.1 Determine the inorganic matters in water and wastewater.

Objective: This module covers the skills and knowledge required to Collect, Transport and Prepare the samples for determination of organic chemicals of water and wastewater, Determine pH of water and wastewater as per Standard. Determine Turbidity of water and wastewater as per Standard, Determine Acidity of water and wastewater as per Standard, Determine Alkalinity of water and wastewater as per Standard, Determine Chlorides of water and wastewater as per Standard, Determine Sulfur of water and wastewater as per Standard Method. Determine Heavy metals of water and wastewater as per Standard. and maintain a safe work environment

Duration: 16Hours

Theory: 2Hours

Practice: 14 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect, Transport and Prepare the samples for determination of inorganic chemicals of water and wastewater	Trainee will be able to: - Locate sampling site. - Assemble required equipment - Check operations of all sampling equipment & accessories. - Decontaminate the sample container and sampling tools - Collect samples according to sampling plan & standard sampling procedures	- Define and enlist organic chemicals - Explain the procedure of collection of samples Practical activity Prepare the samples for determination of inorganic chemicals of water and wastewater by ion chromatography	Theory-0.5Hrs Practice-1.5Hrs Total- 2 Hrs	Sampling bottles Beaker Burette Pipette Erlenmeyer flasks Indicator solutions Sampling bottles Beaker Burette Pipette Erlenmeyer flasks	Class room and Lab



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	- Take photos/snaps of sampling sites and samples. - Record all information and label samples in accordance with traceability requirements. - Transport samples from site to lab in accordance with standards			Indicator solutions	
LU2. Determine pH of water and wastewater as per Standard Method for the Examination of Water and Wastewater. .	Trainee will be able to: - Prepare apparatus to determining pH of Water and Wastewater. - Prepare the Samples as per standard guidelines - Identify chemicals to be used as reagents. - Perform test as per standard procedure. - Record the results of the test. - Compare the test results with NEQS - Prepare the test record sheet	- Define Ph of water and wastewater - Enlist ph range of water and wastewater Practical activity Determine pH of water and wastewater by Ph meter	Theory-0.5Hrs Practice-1Hrs Total- 1.5 Hrs	Sampling bottles pH meter Beaker Burette Pipette Erlenmeyer flasks Indicator solutions Samples Ph meter	Class room and Lab



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LU3. Determine Turbidity of water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus to determining turbidity. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Define turbidity of water and wastewater • Enlist turbidity value of drinking water • Define NEQS National Environmental Quality Standards Practical activity Determine Turbidity of water and wastewater by turbidity meter	Theory-0.5Hrs Practice-1Hrs Total- 1.5Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions turbidity meter	Class room and Lab
LU4. Determine Acidity of water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus for determining acidity as per Standard Method for the Examination of Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure.	• Define acidity of water and wastewater Practical activity Determine Acidity of water and wastewater by titration method	Theory-0.5Hrs Practice-1.5Hrs Total- 2Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions	Class room and Lab



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	- Record the results of the test. - Compare the test results with NEQS - Prepare the test record sheet				
LU 5. Determine Alkalinity of water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: - Prepare apparatus to determining alkalinity. - Prepare the Samples as per standard guidelines - Identify chemicals to be used as reagents. - Perform test as per standard procedure. - Record the results of the test. - Compare the test results with NEQS - Prepare the test record sheet	Define alkalinity of water and wastewater Practical activity Determine Alkalinity of water and wastewater by titration	Theory-0Hrs Practice-02Hrs Total- 2Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions	Lab
LU 6. Determine Chlorides of water and wastewater as per Standard Method for the Examination of Water and Wastewater	Trainee will be able to: - Prepare apparatus for determining chlorides. - Prepare the Samples as per standard guidelines - Identify chemicals to be used as reagents.	- Define chlorides - Mention the range of chlorides in drinking water Practical activity Determine Chlorides of water and wastewater by titration	Theory-0Hrs Practice-1Hrs Total- 1 Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions	Lab



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	• Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS. • Prepare the test record sheet.				
LU 7. Determine Sulfur of water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus to determining Sulphur. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS. • Prepare the test record sheet.	• Define sulfur of water • Mention the amount of sulfur present in water Practical activity Determine Sulfur of water and wastewater in environmental lab	Theory-0Hrs Practice-2Hrs Total- 2 Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions	Lab
LU 8. Determine Heavy metals water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus to determining Heavy metals. • Prepare the Samples as per standard guidelines	• Define heavy metals of wastewater • Enlist the sources of heavy metals in water Practical activity	Theory-0Hrs Practice-2Hrs Total- 2 Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks	Lab



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	- Identify chemicals to be used as reagents. - Perform test as per standard procedure. - Record the results of the test. - Compare the test results with NEQS. - Prepare the test record sheet.	Determine Heavy metals of water and wastewater by Atomic Absorption Spectrometry		Indicator solutions	
LU 9. Maintain a safe work environment	Trainee will be able to: - Use safe work procedures. - Adopt personal protective equipment (PPE) - Minimize generation of wastes and environmental impacts of testing - Collect or dispose of all waste in accordance with environmental/quarantine requirements and workplace procedures - Place store equipment properly - Back-up samples in accordance with workplace procedures	Enlist PPE's Practical activity Maintain a safe work environment in environmental lab	Theory-0Hrs Practice-2Hrs Total- 2 Hrs	pH meter Beaker Turbidity meter Burette Pipette Erlenmeyer flasks Indicator solutions	Lab



11.11.2 Determine organic matters in water and wastewater

Objective: This module covers the skills and knowledge required Collect, Transport and Prepare the samples for determination of organic chemicals of water and wastewater, Determine Chemical Oxygen Demand (COD) in water and wastewater as per Standard Method for the Examination of Water and Wastewater, Determine Total Organic Carbon (TOC) in water and wastewater as per Standard Method for the Examination of Water, and Wastewater and Maintain a safe work environment

Duration: 15Hours

Theory: 3Hours

Practice: 12Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect, Transport and Prepare the samples for determination of organic chemicals of water and wastewater	Trainee will be able to: • Locate Sample Site • Access relevant job instructions from Standard Method for the Examination of Water and Wastewater. • Assemble all required equipment and reagents. • Collect samples from site and preserve with labeling (including location, documentation and holding time) in accordance with appropriate test method • Transport samples from site to lab in accordance with standards	• Explain principles of organic matter Practical activity Prepare the samples for determination of organic chemicals of water and wastewater by UV spectrometer	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Sampling bottles Beaker (250 ml) Measuring cylinder Dropper Stirrer	Class room and lab



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LU2. Determine Chemical Oxygen Demand (COD) in water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus for determining COD as per Standard Method for the Examination of Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Define COD • Explain performance Techniques Practical activity Determine Chemical Oxygen Demand (COD) in water and wastewater in environmental lab	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Sampling bottles Beaker (250 ml) Measuring cylinder Dropper Stirrer	Class room and lab
LU3. Determine Total Organic Carbon (TOC) in water and wastewater as per Standard Method for the Examination of Water and Wastewater	Trainee will be able to: • Prepare apparatus for determining TOC as per Standard Method for the Examination of Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure.	• Define TOC Practical activity Determine Total Organic Carbon (TOC) in water and wastewater in environmental lab	Theory-1Hrs Practice-03Hrs Total- 4Hrs	Sampling bottles Beaker (250 ml) Measuring cylinder Dropper Stirrer	Class room and Lab



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	- Record the results of the test. - Compare the test results with NEQS - Prepare the test record sheet				
LU4. Maintain a safe work environment	Trainee will be able to: - Use safe work procedures and personal protective equipment (PPE) to ensure personal safety and that of others - Minimize generation of wastes and environmental impacts of testing - Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and workplace procedures - Care for and store equipment, used test pieces and back-up samples in accordance with workplace procedures	Enlist PPE'S Practical activity Maintain a safe work environment in environmental lab	Theory-01Hrs Practice-03Hrs Total- 4Hrs	Sampling bottles Beaker (250 ml) Measuring cylinder Dropper Stirrer	Lab



11.11.3 Determine the Physical Characteristics in water and wastewater.

Objective: This module covers the skills and knowledge required to Collect, Transport and Prepare of samples for determination of inorganic chemicals of water and wastewater, Determine Total Solids (TS) in water and wastewater as Standard Method for the Examination of Water and Wastewater, Determine Total Dissolved Solids (TDS) in water and wastewater as per Standard Method for the Examination of Water and Wastewater, Determine Total Suspended Solids (TSS) in water and wastewater as per Standard Method for the Examination of Water and Wastewater and Maintain a safe work environment.

Duration: 15Hours

Theory: 3Hours

Practice: 12Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect, Transport and Prepare of samples for determination of inorganic chemicals of water and wastewater.	Trainee will be able to: • Locate sampling site. • Assemble required equipment • Check operations of all sampling equipment & accessories. • Decontaminate the sample container and sampling tools • Collect samples according to sampling plan & standard sampling procedures • Take photos/snaps of sampling sites and samples. • Record all information and label	• Explain the procedure of collection of water samples • Explain Principles of physical characteristics. Practical activity Prepare of samples for determination of inorganic chemicals of water and wastewater in environmental lab	Theory-01Hrs Practice-03Hrs Total- 4Hrs	Balance Beaker Sampling bottles Measuring Cylinder Filter paper Funnel Dropper	Class room and Lab



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	samples in accordance with traceability requirements. • Transport samples from site to lab in accordance with standards				
LU2. Determine Total Solids (TS) in water and wastewater as Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus for determining Total Solids for Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Define total solids in water • Describe Performance Procedure Practical activity Determine Total Solids (TS) of water and wastewater in environmental lab	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Balance Beaker Measuring Cylinder Filter paper Funnel Dropper	Class room and Lab
LU3. Determine Total Dissolved Solids (TDS) in water and wastewater as per Standard Method for	Trainee will be able to: • Prepare apparatus for determining Dissolved Solids of Water and Wastewater. • Prepare the Samples as per	• Define total dissolved solids • Enlist national Environmental Quality Standards Practical activity Determine Total Dissolved Solids	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Balance Beaker Measuring Cylinder Filter paper Funnel	Class room and Lab



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the Examination of Water and Wastewater.	standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	(TDS) in water and wastewater in environmental lab		Dropper	
LU4. Determine Total Suspended Solids (TSS) in water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus for determining Suspended Solids for Examination of Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Define total suspended solids in water and wastewater Practical activity Determine Total Suspended Solids (TSS) in water and wastewater in environmental lab	Theory-0.5Hrs Practice-1.5Hrs Total- 2Hrs	Balance Beaker Measuring Cylinder Filter paper Funnel Dropper	Lab



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LU5. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental / quarantine requirements and workplace procedures • Clean the equipment • Check serviceability of equipment before storage	• Describe and enlist PPE'S Practical activity Maintain a safe work environment in environmental lab	Theory-0.5Hrs Practice-1.5Hrs Total- 2Hrs	Balance Beaker Measuring Cylinder Filter paper Funnel Dropper	Lab
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11.11.4 Determine the Hardness in Water and Wastewater

Objective: This module covers the skills and knowledge required to Collect, Transport and prepare the samples for determination of inorganic chemicals of water and wastewater, determine the Hardness in water and wastewater as per Standard Method for the Examination of Water and Wastewater and Maintain a safe work environment.

Duration: 10Hours

Theory: 2Hours

Practice: 8Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect, Transport and Prepare the samples for determination of inorganic chemicals of water and wastewater	• Trainee will be able to: • Locate sampling site. • Assemble required equipment • Check operations of all sampling equipment & accessories. • Decontaminate the sample container and sampling tools • Collect samples according to sampling plan & standard sampling procedures • Take photos/snaps of sampling sites and samples. • Record all information and label samples in accordance with traceability requirements. • Transport samples from site to lab in	• Explain reagents used in experiment • Practical activity • Prepare the samples for determination of inorganic chemicals of water and wastewater in environmental lab	Theory-1Hrs Practice-03 Hrs Total- 4Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device	Class room and Lab



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	accordance with standards				
LU2. Determine the Hardness in water and wastewater as per Standard Method for the Examination of Water and Wastewater.	• Trainee will be able to: • Prepare apparatus for determining Hardness as per Standard Method for the Examination of Water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Brief Hardness in water and wastewater • Practical activity • Determine the Hardness in water and wastewater using soap kit	Theory-1Hrs Practice-04Hrs Total- 5Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device soap kit	Class room and Lab
LU3. Maintain a safe work environment	• Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance	• Explain procedure of safe work practices • Practical activity • Maintain a safe work environment in environmental lab	Theory-0Hrs Practice-1Hrs Total- 01Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device Point	Lab



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	with environmental / quarantine requirements and workplace procedures • Clean the equipment • Check serviceability of equipment before storage				
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11.11.5 Determine the bacteriological impurities in Water and Wastewater.

Objective: This module covers the skills and knowledge required to Collect, Transport and prepare the samples for determination of inorganic chemicals of water and wastewater, Determine Pathogens in water and wastewater as per Standard Method for the Examination of Water and Wastewater and Maintain a safe work environment.

Duration: 24Hours

Theory: 4Hours

Practice: 20Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect, Transport and Prepare the samples for determination of inorganic chemicals of water and wastewater	Trainee will be able to: • Locate sampling site. • Assemble required equipment • Check operations of all sampling equipment & accessories. • Decontaminate the sample container and sampling tools • Collect samples according to sampling plan & standard sampling procedures • Take photos/snaps of sampling sites and samples. • Record all information and label samples in accordance with traceability requirements. • Transport samples from site to lab in accordance with standards	• Brief on bacteriological impurities in water and wastewater. Practical activity Prepare the samples for determination of inorganic chemicals of water and wastewater in environmental lab	Theory-01Hrs Practice-01 Hrs Total- 2Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device Point	Class room and Lab



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LU2. Determine Pathogens in water and wastewater as per Standard Method for the Examination of Water and Wastewater.	Trainee will be able to: • Prepare apparatus for determining Pathogens for water and Wastewater. • Prepare the Samples as per standard guidelines • Identify chemicals to be used as reagents. • Perform test as per standard procedure. • Record the results of the test. • Compare the test results with NEQS • Prepare the test record sheet	• Define pathogens • Enlist sources of pathogens in water Practical activity Determine Pathogens in water and wastewater by DNA microarray	Theory-02Hrs Practice-15Hrs Total- 18Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device Point	Class room and Lab
LU3. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental / quarantine requirements and workplace procedures • Clean the equipment • Check serviceability of equipment before storage	• Enlist PPE'S Practical activity Maintain a safe work environment	Theory-01Hrs Practice-04Hrs Total- 5Hrs	Beaker Measuring cylinder Dropper Stirrer Auto-titration device Point	Lab



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11.12. Soft Skills

11.12.1 Manage meetings

Objective: This module covers the skills and knowledge required to manage a range of meetings including overseeing the meeting preparation processes, chairing meetings, organizing the minutes and reporting meeting outcomes. It applies to individuals employed in a range of work environments who are required to organize and manage meetings within their workplace, including conducting or managing administrative tasks in providing agendas and meeting material. They may work as senior administrative staff or may be individuals with responsibility for conducting and chairing meetings in the workplace.

Duration: 09 Hours

Theory: 03 Hours

Practice: 06 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for meetings	Trainee will be able to: - Develop agenda in line with stated meeting purpose - Ensure style and structure of meeting are appropriate to its purpose - Identify meeting participants and notify them in accordance with organizational procedures	- Outline meeting terminology, structures, arrangements - Outline responsibilities of the chairperson and explain group dynamics in relation to managing meetings - Describe options for meetings including face-to-face, teleconferencing, web-conferencing	Theory-01 Hrs Practice-02 Hrs Total- 03 Hrs	Multi media Computer system Attendance sheet Note book	Class room+ Lab



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	- Confirm meeting arrangements in accordance with requirements of meeting - Dispatch meeting papers to participants within designated timelines	and using webcams. Practical Activity Prepare for lab staff meeting			
LU2. Conduct meetings	Trainee will be able to: - Chair meetings in accordance with organizational requirements, agreed conventions for type of meeting and legal and ethical requirements - Conduct meetings to ensure they are focused, time efficient and achieve the required outcomes - Ensure meeting facilitation enables participation, discussion, problem-solving and resolution of issues - Brief minute-taker on method for recording meeting notes in accordance with organizational requirements and conventions for type of meeting	Identify the relevant organizational procedures and policies regarding meetings, chairing and minutes including identifying organizational formats for minutes and agendas. Practical Activity Conduct lab staff meeting	Theory-01 Hrs Practice-02 Hrs Total- 03 Hrs	Multi media Computer system Attendance sheet Note book	Class room+ Lab



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LU3. Follow up meetings	Trainee will be able to: • Check transcribed meeting notes to ensure they reflect a true and accurate record of the meeting and are formatted in accordance with organizational procedures and meeting conventions • Distribute and store minutes and other follow-up documentation within designated timelines, and according to organizational requirements • Report outcomes of meetings as required, within designated timelines	• Record and store meeting documentation • Running the meeting and following up Practical Activity Follow up meeting and prepare meeting notes	Theory-01 Hrs Practice-02 Hrs Total- 03 Hrs	Multi media Computer system Attendance sheet Note book	Class room+ Lab
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11.12.2 Manage workforce planning

Objective: This module covers the skills and knowledge required to manage planning in relation to an organization's workforce including researching requirements, developing objectives and strategies, implementing initiatives and monitoring and evaluating trends. It applies to individuals who are human resource managers or staff members with a role in a policy or planning unit that focuses on workforce planning.

Duration: 18 Hours

Theory: 06 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Research workforce requirements	Trainee will be able to: - Review current data on staff turnover and demographics - Assess factors that may affect workforce supply - Establish the organization's requirements for a skilled and diverse workforce	- Explain current information about external labor supply relevant to the specific industry or skill requirements of the organization - Review relevant trends and supply and demand factors that will impact on an organization's workforce Practical Activity Research workforce to forecast and prepare for your administration problem	Theory-02Hrs Practice-03 Hrs Total- 05Hrs	Note book Pen	Class room+ Lab
LU2. Develop workforce	Trainee will be able to: Review organizational strategy and	Organize workforce requirements objectives and	Theory-01Hrs Practice-03Hrs		Class room+



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objectives and strategies	establish aligned objectives for modification or retention of the workforce - Consider strategies to address unacceptable staff turnover, if required - Define objectives to retain required skilled labor - Define objectives for workforce diversity and cross-cultural management - Define strategies to source skilled labor - Communicate objectives and rationale to relevant stakeholders - Obtain agreement and endorsement for objectives and establish targets - Develop contingency plans to cope with extreme situations	strategies Outline industrial relations relevant to the specific industry Practical Activity Develop workforce objectives and strategies for your administration problem	Total- 04Hrs		Lab
LU3. Implement initiatives to support workforce planning objectives	Trainee will be able to: - Implement action to support agreed objectives for recruitment, training, redeployment and redundancy - Develop and implement strategies to assist workforce to deal with organizational change - Develop and implement strategies to	- Develop a workforce plan that includes relevant research and specific strategies to ensure access to a skilled and diverse workforce. - Manage workforce planning including developing,	Theory-01Hrs Practice-03Hrs Total- 04Hrs		Class room+ Lab



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	assist in meeting the organization's workforce diversity goals • Implement succession planning system to ensure desirable workers are developed and retained • Implement programs to ensure workplace is an employer of choice	implementing, monitoring and reviewing strategies to meet workforce needs. Practical Activity Implement initiatives to support workforce planning objectives			
LU4. Monitor and evaluate workforce trends	Trainee will be able to: • Review workforce plan against patterns in exiting employee and workforce changes • Monitor labor supply trends for areas of over- or under-supply in the external environment • Monitor effects of labor trends on demand for labor • Survey organizational climate to gauge worker satisfaction • Refine objectives and strategies in response to internal and external changes and make recommendations in response to global trends and incidents • Regularly review government policy on labor demand and supply	• review relevant trends and supply and demand factors that will impact on an organization's workforce Practical Activity Monitor and evaluate workforce trends.	Theory-02Hrs Practice-03Hrs Total- 05Hrs		Class room+ Lab



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	Evaluate effectiveness of change processes against agreed objectives				
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11.12.3 Undertake project work

Objective: This module covers the skills and knowledge required to undertake a straightforward project or a section of a larger project. It covers developing a project plan, administering and monitoring the project, finalizing the project and reviewing the project to identify lessons learned for application to future projects. This unit applies to individuals who play a significant role in ensuring a project meets timelines, quality standards, budgetary limits and other requirements set for the project.

Duration: 15 Hours

Theory: 03 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Define project	Trainee will be able to: • Access project scope and other relevant documentation • Define project stakeholders • Seek clarification from delegating authority of issues related to project and project parameters • Identify limits of own responsibility and reporting requirements • Clarify relationship of project to other projects and to the organization's objectives • Determine and access available resources to undertake project	• Define project scope • Define project stakeholders. • Relationship of project to organizational objectives and other projects • State reporting requirements • State resource requirements Practical Activity Identify a construction site	Theory-0.5Hrs Practice-02 Hrs Total- 2.5 Hrs	Notebook Pen	Class room+ Lab



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LU2. Develop project plan	Trainee will be able to: • Develop project plan in line with the project parameters • Identify and access appropriate project management tools • Formulate risk management plan for project, including Work Health and Safety (WHS) • Develop and approve project budget • Consult team members and take their views into account in planning the project • Finalize project plan and gain necessary approvals to commence project according to documented plan	• Describe outline types of documents and other sources of information commonly used in defining the parameters of a project • Describe outline the organization's mission, goals, objectives and operations and how the project relates to them • Define HSE (Health , Safety and Environment) Practical Activity • Develop a plan of HSE study for a construction site • Prepare project plan	Theory-0.5 Hrs Practice-04Hrs Total- 4.5 Hrs	Notebook Pen	Class room+ Lab
LU3. Administer and monitor project	Trainee will be able to: • Take action to ensure project team members are clear about their responsibilities and the project requirements • Provide support for project team members, especially with regard to specific needs, to ensure that the quality of the expected	• Explain processes for identifying and managing risk in a project • Provide support to team members to enable them to achieve deliverables and to transition them as appropriate at completion of the project	Theory-01 Hrs Practice-03Hrs Total- 04 Hrs	Notebook Pen	Class room+ Lab



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	outcomes of the project and documented time lines are met - Establish and maintain required recordkeeping systems throughout the project - Implement and monitor plans for managing project finances, resources and quality - Complete and forward project reports as required to stakeholders - Undertake risk management as required to ensure project outcomes are met - Achieve project deliverables	Practical Activity Administer and monitor HSE at construction site.			
LU4. Finalize project	Trainee will be able to: - Complete financial recordkeeping associated with project and check for accuracy - Ensure transition of staff involved in project to new roles or reassignment to previous roles - Complete project documentation and obtain necessary sign-offs for concluding project	Finalize the project including documentation, sign-offs and reporting Review and document the project outcomes. Practical Activity Finalize the project report	Theory-01 Hrs Practice-03Hrs Total- 04 Hrs	Notebook Pen	Class room+ Lab



11.12.4 Identify and communicate trends in career development

Objective: This module covers the skills and knowledge required to identify and communicate career trends. It establishes the need to interact professionally with others in assessing career needs, to effectively assist clients identify competencies they require for a career and employability in a given context. It also examines how to maintain quality of career development services and professional practice. It applies to individuals seeking to identify and communicate trends in career development.

Duration: 16 Hours

Theory: 04 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Research and confirm career trends	Trainee will be able to: • Apply knowledge of changing organizational structures, lifespan of careers and methods of conducting work search, recruitment and selection processes • Analyze changing worker and employer issues, rights and responsibilities in context of changing work practices • Examine importance of quality careers development services • Maintain all research, documentation, sources and references (electronic or physical) to a high degree of currency	• Describe diversity and its potential effects on career choices • Explain techniques used to analyze trends. Practical Activity Research career trends in college administration	Theory-01Hrs Practice-03 Hrs Total- 4 Hrs	Notebook pen	Class room+ Lab



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	and relevance - Analyze implications of relevant policy, legislation, professional codes of practice and national standards relating to worker and employer issues - Research changes and trends in theory of career development counseling and practice - Confirm clusters, levels and combinations of transferable employability skills and preferences that may open employment options spanning more than one occupation or career pathway				
LU2. Assess and confirm ongoing career development needs of target group	Trainee will be able to: - Analyze history and records in assessing needs of target group - Assess success of previous career development services and techniques used for individual or target group - Deploy other means to investigate appropriate care and counseling approaches as required - Maintain privacy and security of all data,	- outline relevant policy, legislation, codes of practice and standards relevant to career development - explain recruitment and selection processes in the context of career development services - describe diversity and its potential effects on career choices - identify choices and career	Theory-1.5 Hrs Practice-06Hrs Total- 7.5 Hrs	Notebook pen	Class room+ Lab



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	research and personal records according to relevant policy, legislation, professional codes of practice and national standards • Establish existing work-life balance requirements, issues and needs	development needs for individuals and target groups within a given context Practical Activity Assess and confirm ongoing career development needs in college			
LU3. Maintain quality of career development services and professional practice	Trainee will be able to: • Analyze and review relevance of career theories, models, frameworks and research for target group • Incorporate into career development services and professional practice, major changes and trends influencing workplace and career-related options and choices • Comply with all relevant policy, legislation, professional codes of practice and national standards that influence delivery of career development services	• Report and document management of research and career development materials • Comply with all relevant local, state/territory and national legislation, policies and practices Practical Activity Maintain quality of career development services	Theory-1.5Hrs Practice-03Hrs Total- 4.5 Hrs	Notebook pen	Class room+ Lab



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11.12.5 Work safely in an office environment

Objective: This module covers the skills and knowledge required to participate in workplace occupational health and safety (OHS) processes to protect workers own health and safety, and that of others.

Duration: 12Hours

Theory: 03 Hours

Practice: 09 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Work safely	Trainee will be able to: - Follow established safety procedures when conducting work - Carry out pre-start systems and equipment checks in accordance with workplace procedures	- Explain responsibilities of employers and employees under relevant health and safety regulation - State relevant safety procedures Practical Activity Identify work safety procedures in construction lab	Theory-0.5 Hrs Practice-02 Hrs Total- 2.5 Hrs	Note book Pen	Class room+ Lab
LU2. Implement workplace safety requirements	Trainee will be able to: - Identify designated persons for reporting queries and concerns about safety in the workplace - Identify existing and potential hazards in the workplace, report them to designated persons and record them in accordance with workplace procedures	- Describe emergency procedures including procedures for fires, accidents and evacuation - Outline commonly used hazard signs and safety symbols Practical Activity Implement workplace safety requirements in construction lab.	Theory-01Hrs Practice-03Hrs Total- 04 Hrs	Note book Pen	Class room+ Lab



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	- Identify and implement workplace procedures and work instructions for controlling risks - Report emergency incidents and injuries to designated persons				
LU3. Participate in OHS consultative processes	Trainee will be able to: - Contribute to workplace meetings, inspections or other consultative activities - Raise OHS issues with designated persons in accordance with organizational procedures - Take actions to eliminate workplace hazards or to reduce risks	- Identify and report hazards to designated personnel - Define OHS (Occupational health and safety) Practical Activity - Participate in OHS consultative processes in construction lab - Practice to take actions to eliminate workplace hazards	Theory-01Hrs Practice-02Hrs Total- 03Hrs	Note book Pen	Class room+ Lab
LU4. Follow safety procedures	Trainee will be able to: - Identify and report emergency incidents - Follow organizational procedures for responding to emergency incidents	- Describe reporting of emergency incidents - Describe relevant health and safety regulations and procedures Practical Activity Perform safety procedures	Theory-0.5Hrs Practice-02Hrs Total- 2.5Hrs	Note book Pen	Class room+ Lab



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11.12.6 Develop workplace documents

Objective: This module covers the skills and knowledge required to interpreting and composing a range of workplace documents from a number of sources. It includes interpreting written information for workplace purposes as well as planning, drafting and reviewing a basic document before writing the final version. The focus is on the content and structure of written materials and not on the use of computer technology

Duration: 18 Hours

Theory: 06 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Interpret written information	Trainee will be able to: • Read workplace materials to identify the subject and key information for using or reporting to others. • Read procedural manuals and codes of practice to locate specific information to carry out work functions in accordance with policy and standards. • Read a range of written materials to locate and select required information for summaries, short reports and responses to requests. • Identify the cultural context and prior knowledge required to interpret	• Describe the problem-solving skills to determine document design and production processes • Explain the usage of resources to assist in document production, such as dictionary, thesaurus, templates, style sheets • Explain the reading and writing procedures at a level to cope with a range of workplace materials • Describe the ways to produce business letters, memos, job applications, resumes, meeting agendas and minutes	Theory-02Hrs Practice-02Hrs Total- 05 Hrs	Computer system Printer Papers Pen Note book	Class room+ Lab



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	workplace information and obtain assistance when required. • Determine audience and purpose for the document • Seek assistance with interpretation of complex materials in accordance with organizational procedures.	Practical Activity Interpret written information for meeting agendas and minutes of meeting			
LU2. Develop written materials	Trainee will be able to: • Identify and comply with established requirements for a range of written materials in accordance with organizational procedures and standard templates. • Determine format and structure • Establish key points for inclusion • Identify organizational requirements • Establish method of communication • Establish means of communication	• Describe the ways to write and sequence paragraphs according to the required purpose of written material • Outline the linking ideas in written material through selection and use of words, grammatical structures, headings and punctuation appropriate to the purpose • Describe the problem-solving skills to determine document design and production processes • Describe the ways to produce business letters, memos, job applications, resumes, meeting agendas and minutes	Theory-01Hrs Practice-02Hrs Total- 03 Hrs	Computer system Printer Papers Pen Note book	Class room+ Lab



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		Practical Activity Develop meeting agenda and meeting of minutes			
LU3. Draft document	Trainee will be able to: • Develop draft document to communicate key points • Obtain and include any required additional information • Prepare written information in an accurate, concise and unambiguous manner that meets intended audience and organizational requirements.	• Elaborate spelling, punctuation and grammar for workplace documents at an experienced level • Describe the problem-solving skills to determine document design and production processes • Explain the usage of resources to assist in document production, such as dictionary, thesaurus, templates, and style sheets. Practical Activity Prepare meeting agenda and minutes of meetings	Theory-01Hrs Practice-03Hrs Total- 04 Hrs	Computer system Printer Papers Pen Note book	Class room+ Lab
LU4. Review document	Trainee will be able to: • Check draft for suitability of tone for audience, purpose, format and communication style • Check draft for readability, grammar, spelling, sentence and paragraph construction and correct	• Elaborate the ways of proofreading and editing documents to ensure clarity of meaning and conformity to organizational requirements. Practical Activity Review prepared meeting agenda and minutes of meeting.	Theory-01Hrs Practice-02Hrs Total- 03 Hrs	Computer system Printer Papers Pen Note book	Class room+ Lab



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	any inaccuracies or gaps in content. • Check draft for sequencing and structure • Check draft to ensure it meets organizational requirements • Ensure draft is proofread, where appropriate, by supervisor or colleague				
LU5. Write final document	Trainee will be able to: • Make and proofread necessary changes • Ensure document is sent to intended recipient within required time frames • File copy of document in accordance with organizational policies and procedures	• Describe to re write the document after appropriate changing Practical Activity Prepare final document of meeting agenda and minutes of meeting.	Theory-01Hrs Practice-03Hrs Total- 04Hrs	Computer system Printer Papers Pen Note book	Class room+ Lab



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11.12.7 Maintain professionalism in the workplace

Objective: This module covers the skills and knowledge required to maintain a professional image in the workplace, including behaving ethically, demonstrating motivation, respecting timeframes and maintaining personal appearance.

Duration: 12 Hours

Theory: 03 Hours

Practice: 09 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Respect work timeframes	Trainee will be able to: • Demonstrate punctuality in meeting, set working hours and times. • Utilize working hours only for working and follow company regulations. • Complete work tasks within deadlines according to order of priority • Supervisors are informed of any potential delays in work times or projects.	• Explain application of good manners and right conduct • Outline the company code of conduct/values Practical Activity Prepare a presentation and demonstrate punctuality in working hours.	Theory-01 Hrs Practice-03 Hrs Total- 04 Hrs	Note book Pen Multimedia Computer system	Class room+ Lab
LU2. Maintain personal appearance and hygiene	Trainee will be able to: • Clean hair, body and nails regularly. • Wear suitable cloths for the workplace, and respect local and cultural contexts • Meet specific company dress code	• State workplace hygiene standards • Explain basic practices for oral and personal hygiene • Describe common products used for oral and personal hygiene	Theory-01Hrs Practice-03Hrs Total- 04 Hrs	Note book Pen Multimedia Computer system	Class room+ Lab



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	requirements	Practical Activity Demonstrate personnel appearance and hygiene			
LU3. Maintain adequate distance with colleagues and clients	Trainee will be able to: - Respect personal space of colleagues and clients with reference to local customs and cultural contexts. - Keep sufficient distance from others - Avoid cross transmission of infections (especially through respiration)	- Explain basic practices for adequate distance. - Explain work responsibilities/job functions Practical Activity Demonstrate adequate distance with colleagues and clients	Theory-0.5Hrs Practice-1.5 Hrs Total- 02 Hrs	Note book Pen Multimedia Computer system	Class room+ Lab
LU4. Work in an ethical manner	Trainee will be able to: - Follow company values/ethics codes of ethics and/or conduct, policies and guidelines. - Use company resources in accordance with company ethical standards. - Conduct personal behavior and relationships in accord with ethical standards and company policies. - Undertake work practices in compliance with company ethical standards, organizational policy and	- Describe communication skills - Explain work responsibilities/job functions - Outline the Company regulations, performance and ethical standards. Practical Activity Demonstrate ethical manners in accordance with company policy.	Theory-0.5Hrs Practice-1.5 Hrs Total- 02 Hrs	Note book Pen Multimedia Computer system	Class room+ Lab



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	guidelines. • Instruct co-workers on ethical, lawful and reasonable directives. • Share Company values/practices with co-workers using appropriate behavior and language. • Report work incidents/situations and/or resolved in accordance with company protocol/guidelines.				
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11.12.8 Organize schedules

Objective: This module covers the skills and knowledge required to manage appointments and diaries for personnel within an organization, using manual and electronic diaries, schedules and other appointment systems. It applies to individuals employed in a range of work environments who provide administrative support to teams and individuals.

Duration: 28 Hours

Theory: 04 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Establish schedule requirements	Trainee will be able to: - Identify organizational requirements and protocols for diaries and staff planning tools - Identify organizational procedures for different types of appointments - Determine personal requirements for diary and schedule items for individual personnel - Establish appointment priorities and clarify in discussion with individual personnel	- Describe the key provisions of relevant legislation, standards and codes that affect aspects of business operations or the achievement of team goals. - Describe organizational requirements for managing appointments for personnel within the organization. Practical Activity - Practice to Identify and Develop schedule for organization. - Practice to establishing appointment priorities and clarify in discussion with individual personnel	Theory-02 Hrs Practice-12 Hrs Total- 14 Hrs	Note book Pen	Class room+ Lab



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LU2. Manage schedules	Trainee will be able to: • Identify recurring appointments and deadlines, and schedule these in accordance with individual and organizational requirements • Establish availability of attendees, and schedule new appointments in accordance with required timelines and diary commitments • Negotiate alternative arrangements and confirm when established appointments are changed • Record appointments and manage schedules in accordance with organizational policy and procedures	• Summarize the range of appointment systems that could be used • Outline important considerations when managing the schedules of others. Practical Activity Manage individual and organizational schedules.	Theory-02 Hrs Practice-12 Hrs Total- 14 Hrs	Note book Pen	Class room+ Lab
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11.13 Highway Materials Testing

11.13.1 Determine the physical properties of the road metal

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform Flaky & Elongated Particles test of Road Metal, Compute the Specific Gravity and water absorption of Road Metal and Maintain a safe work environment.

Duration: 14 Hours

Theory: 02 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Samples for Petrography	Trainee will be able to: - Select the quarry Site - Classify the quarry site as guided - Sketch a paper map of the quarry site - Collect the fresh sample from the quarry site - Transport the sample to the laboratory - Prepare the Fresh Samples as per standard guidelines - Handover the Samples for	- Define the Road Metal (Base and Sub-base). - Explain the Importance to collect the basic information pertaining to Site and Materials. - Explain the importance of Sample preparation for Petrography. Practical Activity: - Draw a process flow diagram to prepare the Samples for Petrography to determine Physical Properties of Road Metal. - Prepare the samples for the thin section slides	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Relevant apparatus	Class Room & Lab



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	preparation of Thin Section Slides • Ensure the safety of the samples				
LU2. Perform Flaky & Elongated Particles test of Road Metal	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of ASTM D-4791-95 • Compute the results of the test	• Explain the flaky and elongated particles of Road Metal • What is flakiness and elongation index? • Explain and select the apparatus to perform Flaky & Elongated Particles test of Road Metal. • Explain the purpose to perform the Flaky and elongated particles Test • Explain the Method to collect the Sample of Flaky & Elongated particles of Road Metal as per the standard. • Explain the flaky and elongated particle test as per standard specifications of ASTM D-4791-95 • Explain the procedure to Compute and record the Test results of Flaky and Elongated Particles of Road Metal. Practical Activity: 1. Perform Flaky and Elongated test as per	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Relevant apparatus	Class Room & Lab



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		standard to determine the Physical Properties.			
LU3. Compute the Specific Gravity and water absorption of Road Metal	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications of ASTM C127 • Compute the results of the test • Prepare the test record sheet	• Define Specific Gravity • Explain the water absorption of the Road Metal. • Explain the purpose to Compute the Specific Gravity and water absorption Road Metal. • Explain and select the apparatus to Compute the Specific Gravity and water absorption Road Metal. • Explain the Method to collect the Sample and Test procedure as per standard specification of ASTM C127 • Explain the procedure to Compute and record the Test results of Specific Gravity and water absorption of Road Metal Practical Activity: 1. Perform test as per standard to Compute the Specific Gravity and water absorption of Road Metal.	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Relevant apparatus	Class Room & Lab



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LU4. Maintain a safe work environment	Trainee will be able to: • Use defined safe work practices and personal protective equipment to ensure personal safety and that of others. • Clean all equipment, containers and work area according to workplace procedures • Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures • Clean and care all equipment and check serviceability of equipment before storage	• Explain the importance of safe work practice for self, persons and environment protection. • Enlist the steps to protect the tools and apparatus against the damages. • Explain the standards to dispose of the waste. • Define ISO 14001 and ISO 45001 Codes. Practical Activity: 1. Prepare a list of equipment to be used while performing the samples and Tests for self and for the safety of tools.	Theory-0.5Hrs Practice-03Hrs Total- 3.5Hrs	Relevant apparatus	Class Room & Lab
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11.13.2 Determine the Basic Properties of Road Metal

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform the Gradation Test, Compute the Bulk Density and Void ratio of the Road Metal and Maintain a safe work environment.

Duration: 21 Hours

Theory: 03 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1.Prepare Samples for Petrography	Trainee will be able to: - Select the quarry Site - Classify the quarry site as guided - Sketch a paper map of the quarry site - Collect the fresh sample from the quarry site - Transport the sample to the laboratory - Prepare the Fresh Samples as per standard guidelines - Handover the Samples for preparation of Thin Section Slides - Ensure the safety of the samples	- Explain the Importance to collect the basic information pertaining to basic properties of Road Metal. - Explain the importance of Sample preparation for Petrography to determine basic Properties of Road Metal. Practical Activity: - Draw a process flow diagram to Prepare the Samples for Petrography to determine Basic Properties of Road Metal. - Prepare the samples for the thin section slides	Theory-1.5Hrs Practice-03 Hrs Total- 4.5 Hrs	Relevant apparatus	Class Room & Lab



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LU2. Perform the Gradation Test	Trainee will be able to: • Prepare the Samples as per standard guidelines • Select the appropriate Sieve Set as per requirements • Apply PPEs • Carry out the sieving procedure as per standard guidelines of AASHTO T-27 or ASTM C 136 • Compute the results of the test • Prepare the test record sheet	• Define the gradation of road metal • Explain the significance of the Gradation test • Explain the Procedure of Gradation tests as per the guidelines of AASHTO T-27 or ASTM C 136 • Explain the Test result pertaining to Gradation test Practical Activity: 1. Perform Gradation test as per standard for Road Metal.	Theory-0.5Hrs Practice-06 Hrs Total- 6.5 Hrs	Relevant apparatus	Class Room & Lab
LU3. Compute the Bulk Density and Void ratio of the Road Metal	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Apply PPEs • Ensure the workability of the apparatus • Conduct the test as per standard specifications/ guidelines of ASTM C 29/C29M • Compute the results of the test	• Explain the Bulk density and Void ratio of the road metal • Explain the importance to perform Bulk density and void ratio test • Explain the procedure of Bulk density and Void ratio test as per guidelines of ASTM C 29/C29M • Explain the result pertaining to Bulk density and Void ratio test. Practical Activity: 1. Perform test to Compute the Bulk	Theory-0.5Hrs Practice-06 Hrs Total- 6.5 Hrs	Relevant apparatus	Class Room & Lab



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	Prepare the test record sheet	Density and Void ratio as per standard for Road Metal			
LU4. Maintain a safe work environment	Trainee will be able to: - Use defined safe work practices and personal protective equipment to ensure personal safety and that of others. - Clean all equipment, containers and work area according to workplace procedures - Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures - Clean and care all equipment and check serviceability of equipment before storage	- Explain the importance of safe work practice for self, persons and environment protection while performing test to determine the Basic Properties of Road Metal. - Enlist the steps to protect the tools and apparatus against the damages while performing test to determine the Basic Properties of Road Metal. - Explain the standards to dispose of the waste while performing test to determine the Basic Properties of Road Metal. Practical Activity: - Prepare a list of equipment to be used while performing the samples and Tests for self and for the safety of tools.	Theory-0.5Hrs Practice-03 Hrs Total- 3.5 Hrs	Relevant apparatus	Class Room & Lab



11.13.3 Determine Strength Properties of road Metal

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform the Los Angeles Abrasion Test for road metal, Perform the Impact Value Test for road metal, Execute the Crushing Value Test for road metal and Maintain a safe work environment.

Duration: 27Hours

Theory: 03Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Samples for Petrography	Trainee will be able to: - Select the quarry Site - Classify the quarry site as guided - Sketch a paper map of the quarry site - Collect the fresh sample from the quarry site - Transport the sample to the laboratory - Prepare the Fresh Samples as per standard guidelines - Handover the Samples for preparation of Thin Section Slides	- Explain the Importance to collect the basic information pertaining to Strength properties of Road Metal. - Explain the importance of Sample preparation for Petrography to determine basic Properties of Road Metal. Practical Activity: - Draw a process flow diagram to Prepare the Samples for Petrography to determine Strength Properties of Road Metal. - Prepare the samples for the thin section slides	Theory-0.5Hrs Practice-03 Hrs Total- 3.5 Hrs	Relevant apparatus	Class Room & Lab



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	Ensure the safety of the samples				
LU2. Perform the Los Angeles Abrasion Test for road metal	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Apply PPEs - Ensure the workability of the apparatus - Conduct the test as per standard specifications of AASHTO T-96 or ASTM C 131 - Compute the results of the test - Prepare the test record sheet	- Define abrasion - Explain the Importance of Abrasion - Test Los Angeles Abrasion Test. - Explain the procedure of Los Angeles Abrasion test as per standard specifications of AASHTO T-96 or ASTM C 131 - Enlist the apparatus required for the Test. - Explain the Test result pertaining to abrasion test Practical Activity: - Perform the Los Angeles Abrasion Test as per standard for Road Metal	Theory-0.5Hrs Practice-06 Hrs Total- 6.5 Hrs	Relevant apparatus	Class Room & Lab
LU3. Perform the Impact Value Test for road metal	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Apply PPEs - Ensure the workability of the apparatus	- Explain Impact value of the road Metal - Explain the importance of Impact Value Test - Explain the procedure of Impact value test as per standard specifications of ASTM C-131/C-131M - Enlist the apparatus required for the Test. - Explain the Test result pertaining to	Theory-0.5Hrs Practice-06 Hrs Total- 6.5 Hrs	Relevant apparatus	Class Room & Lab



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	- Conduct the test as per standard specifications of ASTM C-131/C-131M - Compute the results of the test - Prepare the test record sheet	Impact value test Practical Activity: Perform the Impact value Test as per standard for Road Metal			
LU4.Execute the Crushing Value Test for road metal	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Apply PPEs - Ensure the workability of the apparatus - Conduct the test as per standard specifications of IS-2386-4 - Compute the results of the test - Prepare the test record sheet	- Explain Crushing value of the road Metal - Explain the importance of Crushing Value Test - Explain the procedure of Crushing value test as per standard specifications of BS 812 part 110. - Enlist the apparatus required for the Test. - Explain the Test result pertaining to Crushing value test Practical Activity: - Perform the Crushing value Test as per standard for Road Metal	Theory-0.5Hrs Practice-06 Hrs Total- 6.5 Hrs	Relevant apparatus	Class Room & Lab
LU5.Maintain a safe work environment	Trainee will be able to: Use defined safe work practices and personal protective equipment to ensure personal safety and that of	Explain the importance of safe work practice for self, persons and environment protection while performing test to determine the Strength Properties of Road Metal.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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	others. • Clean all equipment, containers and work area according to workplace procedures • Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures • Clean and care all equipment and check serviceability of equipment before storage	• Enlist the steps to protect the tools and apparatus against the damages while performing test to determine the Strength Properties of Road Metal. • Explain the standards to dispose of the waste while performing test to determine the Strength Properties of Road Metal. Practical Activity: 1. Prepare a list of equipment to be used while performing the samples and Tests for self and for the safety of tools.			
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11.13.4 Determine CBR California bearing ratio of Road Base and Sub-Base

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform the Test to Determine CBR for road base, sub-base and Maintain a safe work environment

Duration: 12 Hours

Theory: 02 Hours

Practice: 10Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Samples for Petrography	Trainee will be able to: • Select the quarry Site • Classify the quarry site as guided • Sketch a paper map of the quarry site • Collect the fresh sample from the quarry site • Transport the sample to the laboratory • Prepare the Fresh Samples as per standard guidelines • Handover the Samples for preparation of Thin Section Slides • Ensure the safety of the samples	• Explain the Importance to collect the basic information pertaining to CBR of Road Metal. • Explain the importance of Sample preparation for Petrography to determine CBR of Road Metal. Practical Activity: 1. Draw a process flow diagram to Prepare the Samples for Petrography to determine CBR of Road Metal. 2. Prepare the samples for the thin section slides	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Relevant apparatus	Class Room & Lab
LU2. Perform the Test to	Trainee will be able to: • Prepare the Samples as per standard	• Explain the California bearing ratio • Explain the importance of California bearing	Theory-01Hrs Practice-04Hrs	Relevant apparatus	Class Room



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Determine CBR for road base, sub-base.	guidelines • Select the appropriate Sieve Set as per requirements • Apply PPEs • Carry out the sieving procedure as per standard guidelines of AASHTO T 193 • Compute the results of the test • Prepare the test record sheet	ratio • Explain the procedure of CBR test. • Explain the AASHTO T 193 standards. • Explain the result of CBR test • Enlist the apparatus required for the Test. Practical Activity: 1. Perform the CBR Test as per standard for Road Metal	Total- 05Hrs		& Lab
LU3. Maintain a safe work environment	Trainee will be able to: • Use defined safe work practices and personal protective equipment to ensure personal safety and that of others. • Clean all equipment, containers and work area according to workplace procedures • Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures • Clean and care all equipment and	• Explain the importance of safe work practice for self, persons and environment protection while performing test to determine the CBR of Road Metal. • Enlist the steps to protect the tools and apparatus against the damages while performing test to determine the CBR of Road Metal. • Explain the standards to dispose of the waste while performing test to determine the CBR of Road Metal. Practical Activity: 1. Prepare a list of equipment to be used while performing the samples and Tests for self	Theory-0.5Hrs Practice-03Hrs Total- 3.5 Hrs	Relevant apparatus	Class Room & Lab



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	check serviceability of equipment before storage	and for the safety of tools.			
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11.13.5 Measure the basic properties of bitumen

Objective: This module covers the skills and knowledge required to Determine consistency of bituminous material, Measure the ductility of Bitumen, Determine the softening point of bitumen, Determine Flash and Fire point test for bitumen / cutback, Determine the viscosity of bitumen and Determine the specific gravity of bitumen.

Duration: 38 Hours

Theory: 08 Hours

Practice: 30 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Determine consistency of bituminous material	Trainee will be able to: - Identify penetrometer - Prepare sample for test - Examine, clean and fix the needle - Place the sample in assembly and perform test - Record the reading from dial gauge - Calculate the mean penetration value.	- Explain the component of road i.e. wearing course - Introduction of binders for road metals. - Explain consistency of bituminous material - Explain the Importance to determine the consistency of bituminous material - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D5/D5M. - Explain the procedure to calculate the mean penetration value. - Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine consistency of	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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		bituminous material as per standard.			
LU2. Measure the ductility of Bitumen	Trainee will be able to: - Assemble the standard briquette. - Prepare sample for test and place in water bath - Remove the sample from mould and fix in testing machine. - Operate the testing machine - Measure the distance covered during test - Record the reading from dial gauge - Calculate the average ductility value of bitumen.	- Explain Ductility of bituminous material - Explain the Importance to measure the ductility of bituminous material - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D113 - 99 Standard Test Method for Ductility of Bitumen Material. - Explain the procedure to Calculate the mean ductility value. - Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine ductility value of bituminous material as per standard.	Theory-02Hrs Practice-06 Hrs Total- 08 Hrs	Relevant apparatus	Class Room & Lab
LU3. Determine the softening point of bitumen	Trainee will be able to: - Identify Ring and Ball apparatus - Prepare sample for test - Assemble the apparatus to perform test	- Explain softening point of bituminous material - Explain the Importance to measure the softening point of bituminous material - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D36 - 06 Standard Test Method for	Theory-02 Hrs Practice-06 Hrs Total- 08 Hrs	Relevant apparatus	Class Room & Lab



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	- Record temperature at which balls touch the bottom of cylinder - Calculate the average temperature of softening of bitumen.	Softening Point of Bitumen Material. - Explain the procedure to Calculate the average temperature of softening of bitumen. - Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine softening point of bitumen material as per standard.			
LU4. Determine Flash and Fire point test for bitumen / cutback	Trainee will be able to: - Assemble the apparatus - Heat the bitumen sample and stir the bitumen to maintain uniform temperature in sample - Apply test flame to sample - Record the temperature for flash point - Record the temperature for fire point	- Explain Flash and fire Point of bitumen / Cutback. - Explain the Importance to Determine Flash and Fire point test for bitumen / cutback. - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D3143 / D3143M Standard Test Method for Flash Point of Cutback with Tag Open-Cup Apparatus. - Explain the procedure to record the temperature for flash point. - Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine Flash and Fire point for bitumen / cutback	Theory-01Hrs Practice-06 Hrs Total- 07 Hrs	Relevant apparatus	Class Room & Lab



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LU5. Determine the viscosity of bitumen	Trainee will be able to: - Identify the equipment and calibrate - Prepare sample for test - Pour the hot bitumen in the viscometer. - Place the viscometer in test bath and establish a vacuum of mercury - Note the reading. - Determine the average absolute viscosity.	- Explain the viscosity of bitumen. - Explain the Importance to determine the viscosity of bitumen. - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D2170 / D2170M Standard Test Method to Determine the average absolute viscosity. - Explain the procedure to Determine the average absolute viscosity. - Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine viscosity of Bitumen.	Theory-01Hrs Practice-06 Hrs Total- 08Hrs	Relevant apparatus	Class Room & Lab
LU6. Determine the specific gravity of bitumen	Trainee will be able to: - Identify specific gravity bottle. - Prepare bottle for test - Assemble sample in apparatus according to specifications - Pour the bitumen in bottle	- Explain the specific gravity of bitumen. - Explain the Importance to determine the specific gravity of bitumen. - Explain the procedure to collect the sample and to perform the test as per specifications of ASTM D70 - 97 Standard Test Method to Determine the specific gravity of bitumen. - Explain the procedure to Determine the	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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	as per specification. • Fill the bottle with water • Determine the average specific gravity of bitumen	average specific gravity of bitumen • Enlist the apparatus to use for the test Practical Activity: 1. Perform the Test to Determine the specific gravity of bitumen			
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11.13.6 Determine the bituminous content in a pavement sample

Objective: This module covers the skills and knowledge required to Check test equipment before use, Prepare the sample, Extract quantity of bitumen from bituminous paving and Process and interpret data.

Duration: 16 Hours

Theory: 04 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Check test equipment before use	Trainee will be able to: - Set up test equipment in accordance with test method - Perform pre-use and safety checks in accordance with workplace procedures - Identify faulty equipment and report to appropriate personnel - Check calibration status of instruments.	- Describe structural components of flexible pavement with sketches. - Define wearing course - Describe the bituminous materials - Explain the construction procedure of bituminous roads. - Explain the construction detail of surfacing cold and hot process bituminous macadam, premix asphalt macadam, bituminous concrete pavements and sheet asphalt pavement. - Enlist the Equipment and check the accuracy/calibration prior to use for test of Pavement.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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		- Explain the importance of test for bitumen pavement. Practical Activity: - Clean and check the equipment prior to use for test of bitumen pavement. - Drawing of flexible pavement			
LU2. Prepare the sample	Trainee will be able to: - Identify the apparatus - Assemble the standard briquette mold on a brass plate - Heat and pour the bitumen in the mold - Cool the filled mold at specified temperature - Cut off the excess bitumen	- Explain the procedure to assemble the apparatus prior to use. - Explain the procedure to get sample as per the standard method specified in the relevant ASTM standard and code. Practical Activity: - Assemble the apparatus - Perform the sample as per the standard.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab
LU3. Extract quantity of bitumen from bituminous paving	Trainee will be able to: - Identify centrifuge apparatus - Prepare sample for test - Assemble sample in apparatus according to specifications - Add solvent to disintegrate materials	- Explain the procedure of test to extract the Quantity of bitumen as per the relevant ASTM standard and codes. Practical Activity: - Perform the test to extract the Quantity of bitumen from bituminous paving as per the specified standards.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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	• Extract bitumen from sample • Determine the amount of bitumen	.			
LU4. Process and interpret data	Trainee will be able to: • Check data for accuracy and completeness • Perform required calculations and ensure results are consistent with expected values for the sample type • Interpret trends in data and/or results • Record and report results	• Explain the procedure to compute the test result and its interpretation. Practical Activity: 1. Draw a log of expected result data VS test result data.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Relevant apparatus	Class Room & Lab



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11.13.7 Determine the Mix Design by Marshall Method

Objective: This module covers the skills and knowledge required to Check test equipment before use, Prepare the sample, Perform Marshal stability test for bituminous mixture and Process and interpret data.

Duration: 24 Hours

Theory: 06 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Check test equipment before use	Trainee will be able to: - Set up test equipment in accordance with test method - Perform pre-use and safety checks in accordance with workplace procedures - Identify faulty equipment and report to appropriate personnel - Check calibration status of instruments.	- Describe structural components of roads and airports pavements. - Explain the types of Marshall mix designs. - Explain Marshall Stability and flow. - Describe the Marshall Stability Correction - Enlist the Equipment and check the accuracy/calibration prior to use. - Explain the importance of Marshal stability test for bituminous mixture Practical Activity: - Clean and check the equipment prior to use for test	Theory-02Hrs Practice-03 Hrs Total- 05Hrs	Relevant apparatus	Class Room & Lab
LU2. Prepare the sample	Trainee will be able to: - Identify the apparatus - Assemble the standard	- Explain the procedure to assemble the apparatus prior to use. - Explain the procedure to get sample as per	Theory-02Hrs Practice-06 Hrs Total- 08Hrs	Relevant apparatus	Class Room &



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	briquette mold on a brass plate • Heat and pour the bitumen in the mold • Cool the filled mold at specified temperature • Cut off the excess bitumen	the standard method specified in the relevant ASTM standard and code. Practical Activity: 1. Assemble the apparatus 2. Perform the sample as per the standard.			Lab
LU3. Perform Marshal stability test for bituminous mixture	Trainee will be able to: • Identify the equipment • Prepare sample for test • Place the mould in Marshal test setup • Load the mold in Marshal test setup • Note the reading for vertical deformation of specimen • Vary the bitumen content for next trial • Compile data in tabular form • Compute required parameters • Plot the graph using the	• Explain the procedure to Perform Marshal stability test for bituminous mixture as per the relevant ASTM standard and codes. Practical Activity: 1. Theoretical specific gravity (G_t) of test specimen. 2. Bulk specific gravity of mix (G_m) 3. Air voids (V_v) in test specimen. 4. Volume of bitumen (V_b) in test mix. 5. Voids in mineral aggregates (V_{ma}) of the mix. 6. Voids in mineral aggregates (V_{fb}) filled with bitumen. 7. Determination of Marshall stability and flow 8. Apply stability correction	Theory-01Hrs Practice-06Hrs Total- 07Hrs	Relevant apparatus	Class Room & Lab



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	predetermined parameters Determine optimum bitumen content				
LU4. Process and interpret data	Trainee will be able to: - Check data for accuracy and completeness - Perform required calculations and ensure results are consistent with expected values for the sample type - Interpret trends in data and/or results - Record and report results	- Explain the procedure to compute the test result and its interpretation. - Explain the methods of preparing graphs and their uses. - Explain the construction detail of surfacing cold and hot process bituminous macadam, premix asphalt macadam, bituminous concrete pavements and sheet asphalt pavement. Practical Activity: - Draw graphs to Determine optimum bitumen content	Theory-01Hrs Practice-03 Hrs Total- 04Hrs	Relevant apparatus	Class Room & Lab



11.13.8 Evaluate the Job Mix Formula for Asphaltic Concrete

Objective: This module covers the skills and knowledge required to perform quality tests over coarse aggregate, Perform the quality tests over fine aggregates, Perform the quality tests over Bitumen and Prepare Trial batch of Job mix Formula for Asphalt Configures.

Duration: 40 Hours

Theory: 04 Hours

Practice: 36Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform quality tests over coarse aggregate	Trainee will be able to: - Prepare the test samples - Select the apparatus to be used - Arrange Apparatus as per requirements - Apply PPEs - Ensure the workability of the apparatuses - Conduct the test as per standard specifications of AASHTO, ASTM - Compute the results of the test - Prepare the test record sheet	- Explain the importance of Quality test of coarse aggregates. - Explain the procedure to prepare the sample of Coarse aggregates - Enlist the apparatus required to perform the sample and test. - Explain the importance of the workability and calibration of apparatus. - Explain the procedure to perform Quality test of coarse aggregates as per AASHTO, ASTM standards. Practical Activity: - Clean and Check the apparatus. - Perform the Quality test of coarse aggregates as per standards.	Theory-01Hrs Practice-09Hrs Total- 10Hrs	Relevant apparatus	Class Room & Lab



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LU2. Perform the quality tests over fine aggregates	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Arrange Apparatus as per requirements • Apply PPEs • Ensure the workability of the apparatuses • Conduct the test as per standard specifications of AASHTO, ASTM • Compute the results of the test • Prepare the test record sheets	• Explain the importance of Quality test of fine aggregates. • Explain the procedure to prepare the sample of Fine aggregates • Enlist the apparatus required to perform the sample and test. • Explain the importance of the workability and calibration of apparatus. • Explain the procedure to perform Quality test of fine aggregates as per AASHTO, ASTM standards. Practical Activity: 1. Clean and Check the apparatus. 2. Perform the Quality test of fine aggregates as per standards.	Theory-01Hrs Practice-09Hrs Total- 10Hrs	Relevant apparatus	Class Room & Lab
LU3. Perform the quality tests over Bitumen	Trainee will be able to: • Prepare the test samples • Select the apparatus to be used • Arrange Apparatus as per requirements • Apply PPEs • Ensure the workability of the	• Explain the importance of Quality test of Bitumen. • Explain the procedure to prepare the sample of Bitumen • Enlist the apparatus required to perform the sample and test. • Explain the importance of the workability and calibration of apparatus.	Theory-01Hrs Practice-09Hrs Total- 10Hrs	Relevant apparatus	Class Room & Lab



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	apparatuses - Conduct the test as per standard specifications of AASHTO, ASTM - Compute the results of the test - Prepare the test record sheets	- Explain the procedure to perform Quality test of bitumen as per AASHTO, ASTM standards. Practical Activity: - Clean and Check the apparatus. - Perform the Quality test of Bitumen as per standards.			
LU4. Prepare Trial batch of Job mix Formula for Asphalt Configures	Trainee will be able to: - Arrange the materials as per the Batching summary sheet - Weigh the desired amounts of materials - Perform test run on the mixture machine - Ensure the workability of the mixer machine - Ensure the standard specifications during mixing procedure - Compute the test results - Fill up the Job mix formula's summary sheet	- Explain the importance to Prepare Trial batch of Job mix Formula for Asphalt Configures. - Define batching. - Enlist the apparatus required to Prepare Trial batch of Job mix Formula for Asphalt Configures. - Explain Trial batch of Job mix Formula for Asphalt Configures as per ASTM and AASHTO standards. - Explain to compute results and keeping records as per standards. Practical Activity: - Evaluate the job mix formula for asphaltic concrete - Draw a process flow diagram pertaining to the procedure of Trial batch of Job mix Formula for Asphalt Configures	Theory-01Hrs Practice-09Hrs Total- 10Hrs	Relevant apparatus	Class Room & Lab



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	• Prepare the test record sheets • Submit the record sheets for approval				
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11.14 Masonry Materials Testing

11.14.1 Perform Physical Test for Brick & Block

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, perform (Porosity) Absorption & Moisture Contents, Perform Sound Test, Perform durability test, Perform **Attrition** / abrasion test, maintain a safe work environment.

Duration: 27 Hours

Theory: 06 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from Laboratory Information Management System (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare workplace for task - Collect required equipment and materials - Plan task sequences for optimum efficiency.	- Importance of physical tests. - Importance of accuracy of tests. - Techniques of physical test. - Explain Weighing and dip techniques - Explain Measuring tools and techniques - Explain Proper material handling Practical Activity Prepare a complete plan for executing a porosity test, sound test, durability test, and Attrition / abrasion test, and hardness test of bricks samples.	Theory- 01Hrs Practice-03Hrs Total- 04Hrs	Lab sheets proforma Equipment check list sheet	Class Room and Lab



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LU2. Perform (Porosity) Absorption & Moisture Contents	Trainee will be able to: - Identify sample. - Weight the Sample - Dip sample in water for specified	- Describe types of bricks and their properties. - Explain sizes and uses of bricks in samples. - Describe Weighing and dip techniques. - Define Porosity. - Describe techniques of dipping the samples - Describe techniques to dry dampness of bricks samples in electric oven. Practical Activity Perform (Porosity) Absorption & Moisture Contents test of bricks.	Theory- 01Hrs Practice-03Hrs Total- 04Hrs	Water Performa sheet Bricks	Class Room and Lab
LU3. Perform Sound Test	Trainee will be able to: - Identify sample. - Strike sample as per standard. - Observe strike sound of sample. - Mention result as per rule (S.O.P) - Maintain record in register.	- Describe sizes and uses of bricks in samples. - Describe type of different bricks and its properties - Define soundness test. - Describe importance of soundness test of bricks. Practical Activity Perform Soundness Test of brick samples.	Theory- 01Hrs Practice-03Hrs Total- 04Hrs	Water Performa sheet Bricks samples of different quality.	Class Room and Lab



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LU4. Perform durability test	- Identify sample. - Drop sample from specified height on hard surface - Differentiate sample. - Apply formula - Calculate average for samples - Maintain record in register.	- Describe types of physical test. - Operations of physical tests. - Sequence of physical tests. - Techniques of physical test. - Capacity of physical test equipment. - Sizes and uses of bricks in samples - Weighing and dip techniques Practical Activity Perform durability test of brick samples.	Theory- 01 Hrs Practice-04 Hrs Total- 05 Hrs	Water Performa sheet Bricks samples of different quality Duster Grease	Class Room and Lab
LU5. Perform Attrition / abrasion test	Trainee will be able to: - Identify samples in required numbers and weight. - Put sample in drum in specified numbers - Lock the Drum. - Check angle of inclination for drum - Rotate drum for specified revolutions and time. - Open Drum Safely - Clean & Weigh the samples - Apply formula - Compute result percentage. - Maintain Test record in register.	- Describe importance of abrasion test for materials. - Specifications as per requirements. - Sequences of operations of test. - Precautions of putting stone sample in drum. Practical Activity Perform Attrition / abrasion test of brick samples.	Theory- 01 Hrs Practice-04 Hrs Total- 05 Hrs	Water Performa sheet Bricks Duster Grease	Class Room and Lab



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LU6. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental / quarantine requirements and workplace procedures • Clean the equipment • Check serviceability of equipment before storage	• Describe lab safety precautions and Lab dress. • Define capacity of physical test equipment. • Define capacity of trolley / table. • Describe handling of materials. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.	Theory- 01 Hrs Practice-04 Hrs Total- 05 Hrs	Lab sheet proforma And equipment check list Duster	Class Room and Lab
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11.14.2 Perform Chemical Test for Brick & Block

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, Perform Chemical / Efflorescence test for bricks and blocks (Soluble Salt Test), Perform Acid Test for bricks and blocks, Perform Crystallization Test for bricks and blocks, Maintain a safe work environment.

Duration: 12 Hours

Theory: 04 Hours

Practice: 08 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from laboratory information management system (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare and workplace for task - Assemble / collect all required equipment and materials - Plan task / work sequences for optimum efficiency	- Introduce lab equipment use in chemical test for brick and block. - Explain LIMS - Selection of sample. - Explain in detail for proper utilization of workplace for task. - Introduction of work sequences to execute the task. Practical Activity - Prepare a complete plan for executing a complete chemical test of brick and block.	Theory-01 Hrs Practice-01 Hrs Total- 02 Hrs	Lab sheets proforma Equipment check list sheet	Class Room and Lab



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LU2. Perform Chemical / Efflorescence test for bricks and blocks (Soluble Salt Test)	Trainee will be able to: • Select sample. • Dip the brick / block in water for specified time. • Dry the sample in shade for specified time. • Check the color and surface after specified time • Check Randomly different samples • Maintain record in register.	• Introduction to Salt / Efflorescence test for bricks and blocks. • Explain operations of Salt tests. • Describe importance of Salt / Efflorescence tests. • Describe techniques of Salt / Efflorescence test. • Describe types of under burnt and over burnt bricks properties. • Explain capacity of Salt / Efflorescence test. Practical Activity Perform efflorescence test of a brick sample.	Theory-01Hrs Practice-02 Hrs Total- 03 Hrs	Chemical / Acids Performa sheet Water Bricks Duster Grease	Class Room and Lab
LU3. Perform Acid Test for bricks and blocks	Trainee will be able to: • Select sample. • Dip sample 5% Sulphuric Acid Solution for the specified time. • Dry the sample • Check stone sample sharpness • Check Randomly different samples	• Describe sizes and uses of bricks in samples • Describe weighing of brick sample techniques. • Define specifications as per requirements • Describe importance of Acid test for bricks and blocks.	Theory-01Hr Practice-02Hrs Total- 3Hrs	Chemical / Acids Sulphuric Acid Performa sheet \ Bricks Duster Grease	Class Room and Lab



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	• Maintain record in register.	• Define PH value. Practical Activity Perform acid test of brick and block sample.			
LU4. Perform Crystallization Test for bricks and blocks	Trainee will be able to: • Select sample. • Weight and dry the sample. • Dry the sample • Dip sample in 14% solution of Sodium Sulfate (Na₂SO₄) for specified time • Dry sample for specified temperature & weight • Repeat test on sample for specified time • Apply formula • Compute result percentage • Maintain record as per S.O.P.	• Differentiate between Acid and Crystallization • Importance of Crystallization test for bricks and blocks. Practical Activity Perform crystallization test of brick and block sample.	Theory-0.5Hr Practice-02 Hrs Total-2.5 Hrs	Chemical / Acids Sodium Sulfate (Na₂SO₄) Performa sheet Pencil Rubber Scale Bricks	Class Room and Lab
LU5. Maintain a safe work environment	Trainee will be able to: • Use PPEs • Apply safe work practices • Rehabilitate sampling site • Minimize generation of wastes • Collect and dispose all waste	• Describe importance of PPEs processes. • Describe advantages of PPEs. • Describe importance of workplace safety. • Explain care to keep sample in solution. Practical Activity	Theory-0.5Hr Practice-01 Hrs Total- 1.5 Hrs	Lab sheet proforma And equipment check list Duster	Class Room and Lab



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	• Clean and care all equipment. Check serviceability of equipment before storage	• Prepare a PPEs plan in a lab to maintain safe environment. Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.			
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11.14.3 Perform Strength Test for Bricks & Blocks

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Perform Crushing Strength / Impact for (bricks, blocks), Perform Transverse strength test (Modulus of Rupture) for Bricks and Blocks, Perform Hardness test for bricks and blocks, Maintain a safe work environments.

Duration: 20 Hours

Theory: 04 Hours

Practice: 16 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: • Access relevant job instructions from laboratory information management system (LIMS) • Interpret test request to confirm samples to be tested, the test method and equipment involved • Identify hazards to take sample • Prepare and workplace for task • Assemble / collect all required equipment and materials • Plan task / work sequences for optimum efficiency	• Introduce lab equipment use in chemical test for brick and block. • Explain LIMS • Selection of sample. • Explain in detail for proper utilization of workplace for task. • Introduction of work sequences to execute the task. Practical Activity Prepare a complete plan for executing a strength test of bricks and blocks.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Performa sheet Equipment check list	Class Room / Lab



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LU2. Perform Crushing Strength / Impact for (bricks, blocks)	Trainee will be able to: • Select sample. • Fill the Frog / Holes with prerequisite materials. • Dry the brick for specified time and temperature. • Apply Capping • Fix the brick in Compressive testing machine • Apply load at convenient rate on fixed sample. • Check crushing strength on gauge. • Maintain record in register.	• Introduction to Compressive / Crushing Strength test for samples. • Explain operations of Compressive / impact tests. • Importance of Compressive / impact tests. • Describe techniques of Compressive / impact tests. Practical Activity Determined the crushing strength of first-class brick with compressive / crushing strength test.	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Bricks Blocks	Class Room / Lab
LU3. Perform Transverse strength test (Modulus of Rupture) for Bricks and Blocks.	Trainee will be able to: • Select sample / specified specimen. • Fix sample wedge-shaped supports near its ends in the machine. • Apply load until failure at convenient specified rate. • Apply formula • Find out “Modulus of Rupture”. • Maintain record in register.	• Describe types of bricks and their properties. • Explain capacity of Crushing equipment / machine. • Describe measuring tools and techniques • Describe sizes and uses of bricks in samples • Describe capacity of Frog Filling	Theory-0.5Hrs Practice-03 Hrs Total- 3.5 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes	Class Room / Lab



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		- Describe weighing of brick sample techniques. Practical Activity - Determined the Modulus of Rupture of first class brick with Transverse strength test.		Nuts and Bolts. Bricks Blocks	
LU4. Perform Hardness test for bricks and blocks.	Trainee will be able to: - Select & weigh the sample. - Fix the sample on testing machine - Apply load at convenient rate on fixed sample. - Rotate machine for specified revolution and time. - Weigh the sample - Apply formula - Check co-efficient of hardness - Maintain record in register.	- Describe specifications as per requirements - Describe loading capacity of bricks in equipment. - Define co-efficient - Differentiate between Hardness and Crushing strength - Define different type of blocks - Different bricks properties Practical Activity Determined the hardness of first class brick and block with hardness test.	Theory-0.5Hrs Practice-03 Hrs Total- 3.5 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Bricks Blocks	Class Room / Lab
LU5. Maintain a safe work environment	Trainee will be able to: - Use PPEs definitely - Apply safe work practices	- Describe importance of PPEs processes. - Describe advantages of PPEs. - Importance of workplace safety.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Lab sheet proforma And equipment check list	Class Room / Lab



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	• Rehabilitate sampling site and Minimize generation of wastes • Collect and dispose waste in accordance with environmental / quarantine requirements and workplace procedures • Clean all equipment • Check serviceability of equipment before storage.	• Describe care to keep sample in solution. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.		Duster	
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11.14.4 Perform Physical Test for Lime

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, perform visual examination, perform soundness test of lime sample, Perform consistency test of lime samples, find out Initial and final setting time, perform fineness test of lime, Carry out ball test, perform Plasticity test, maintain a safe work environments.

Duration: 15 Hours

Theory: 03 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards associates with the sample preparation, test methods, reagents and equipment. - Collect required equipment and materials - Identify faulty or unsafe components and equipment and report to appropriate personnel - Check calibration status of instruments and report any out-of-calibration items to appropriate personnel. - Plan task sequences for optimum efficiency	- Describe types of physical test - Importance of physical tests - Describe techniques of physical test - Explain Sequence of test operations. Practical Activity - Prepare a complete plan for executing a physical test of lime sample.	Theory- 0.25 Hrs Practice-01 Hrs Total- 1.25 Hrs	Performa sheet Equipment check list	Class Room / Lab



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LU2. Perform visual examination	Trainee will be able to: • Select sample • Observe the color and taste of sample. • Identify the smell. • Identify the presence of lumps • Record observations in lab sheet and prepare test report in the specified lab format	• Measuring tools and techniques • Capacity of trolley / table • Weighing and dip techniques. Practical Activity Make a test report in the specified lab format of visual examination of lime.	Theory- 0.25 Hrs Practice- 01 Hrs Total- 1.25 Hrs	Lab sheet proforma Lime samples water	Class Room/ Lab
LU3. Perform soundness test of lime sample	• Prepare the test mix according to standards • Fill the mix in the cylinder of Le-chatelier apparatus • Cover the cylinder by a glass plate and kept for one hour • Measure distance between the ends of the two indicators. • Place the apparatus for 48 hours in a damp air and then kept for 3 hours in steam. • Cool down the sample at room temperature. • Measure distance between the ends of	• Types of lime and their properties. • Capacity of physical test equipment. • Define soundness test. Practical Activity Perform soundness test of lime sample and prepare report.	Theory- 0.25 Hrs Practice- 01 Hrs Total-1.25Hrs	Lab sheet proforma Lime samples water	Class Room/ Lab



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	the two indicators • Compute the results of the test • Record the test result in lab sheet and prepare test report in the specified lab format				
LU4. Perform consistency test of lime samples	Trainee will be able to: • Identify samples in required numbers and weight. • Place it in water for 24 hours. • Mix the soaked material thoroughly with the help of a mixer. • Place the paste in the mould of the flow table. • Determine the average spread of the material by measuring three diameters at approximately 60° apart. • Add water If the consistency is too stiff. • Add material if too wet for a short period on a clean absorbent surface. • Compute result percentage. • Maintain Test record in register.	• Describe specifications as per requirements • Define different type of lime • Importance of consistency test for materials • Type of different lime and its properties Practical Activity Perform consistency test of lime sample and prepare report.	Theory- 0.25 Hrs Practice- 02 Hrs Total- 2.25 Hrs	Lab sheet proforma Lime samples water	Class Room/ Lab



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LU5. Find out Initial and final setting time.	Trainee will be able to: • Weigh lime sample • Prepare paste of lime • Measure the time. • Fill the molds • Put the mold under vicat apparatus. • Drop the needle and note reading till final value is attained. • Record initial setting time. • Replace the needle with the needle having circular attachment • Note the time when needle leave the impression only. • Record final setting time	• Define setting time. • Explain initial and final setting time. Practical Activity Perform consistency test of lime sample and prepare report.	Theory- 0.25 Hrs Practice- 01 Hrs Total- 1.25 Hrs	Lab sheet proforma Lime samples Water Stop watch	Class Room/ Lab
LU6. Perform fineness test of lime.	Trainee will be able to: • Select sample. • Arrange sieves in such a way that the coarser sieves are placed at the top. • Wash the hydrated lime with the help of a moderate jet of water, not more than 30 minutes. • Dry up the residue on each of the sieve.	• Define Porosity • Define fineness. Practical Activity Perform consistency test of lime sample and prepare report.	Theory- 0.25 Hrs Practice- 02 Hrs Total- 2.5 Hrs	Lab sheet proforma Hydrated Lime samples water	Class Room/ Lab



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	• Calculate the percentage of hydrated lime. • Record data and observations in lab sheets in accordance				
LU7. Carry out ball test	Trainee will be able to: • Prepare the sample • Place the sample in the basin for 6 hours • Observe the disintegration • Observe the expansion with cracks • Observe any kind of adverse effect • Ascertain the class of the lime	• Describe loading capacity of lime in equipment. • Define expansion and disintegration. Practical Activity Perform out ball test of lime sample and prepare report.	Theory- 0.5 Hrs Practice- 02 Hrs Total- 2.5 Hrs	Lab sheet proforma Lime samples water	Class Room/ Lab
LU8. Perform Plasticity test	Trainee will be able to: • Prepare the Sample • Dip sample in water for overnight • Place the sample over a blotting paper • Determine the plasticity of lime	• Mixing properties of lime • Importance of plasticity of lime. • Define expansion and disintegration. Practical Activity Perform Plasticity test of lime sample and prepare report.	Theory- 0.5 Hrs Practice- 01 Hrs Total- 1.5 Hrs	Lab sheet proforma Lime samples Water Blotting paper	Class Room/ Lab



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LU9. Maintain a safe work environment	Trainee will be able to: • Select, wear and use appropriate personal protective equipment (PPE). • Follow workplace procedures when carrying out work tasks. • Keep all work areas clean and free from obstacles • Safely store, transport and dispose of hazardous materials and dangerous goods in accordance with environmental procedures. • Care for and store equipment, used test pieces and back-up samples in accordance with workplace procedures. • Check serviceability of equipment before storage.	• Importance of PPEs processes. • Describe advantages of PPEs. • Importance of workplace safety. • Significance of safe work environment • Importance of maintaining the equipment after tests. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.	Theory- 0.5 Hrs Practice- 01 Hrs Total- 1.5 Hrs	Lab sheet proforma Lime samples Water Blotting paper Duster Grease	Class Room/ Lab
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11.14.5 Perform Chemical Test of lime

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, perform sugar test on lime samples, carry out hydraulic acid test, perform Impurity test, and maintain a safe work environment.

Duration: 12 Hours

Theory: 04 Hours

Practice: 08 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from laboratory information management system (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare and workplace for task - Assemble / collect all required equipment and materials - Plan task / work sequences for optimum efficiency	- Introduction to lime / Impurity test for lime - Explain operations of Lime tests Practical Activity - Prepare a complete plan for executing a chemical test of lime samples.	Theory-01Hr Practice-01 Hrs Total- 02 Hrs	Performa sheet Equipment check list	Class Room/ Lab
LU2. Perform sugar test on lime samples.	Trainee will be able to: - Select sample. - Put 2.50 g of lime into a 250 ml flask, add 35–45 ml of CO₂-free	- Importance of Lime - Techniques for lime tests - Properties of lime - Specifications as per	Theory-1Hrs Practice-01Hrs Total- 02Hrs	Lime Water Lab sheet Proforma Sugar	Class Room/ Lab



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	water and boil for 3 minutes. • Cool to room temperature. • Mix 20 g of sucrose (sugar) in 20 ml of water (= 50% solution • Add this solution to the lime in the flask and shake for 30 minutes. Add more water up to the 250 ml mark. • Filter through a No.1 Whatman paper. Discard the first 15–30 ml of filtrate. Pipette 25 ml into a flask. • Add 5 drops of phenolphthalein. • Titrate with 0.357N sulphuric acid. • Calculate cao amount (as CaO, = ml of 0.357N acid, on the burette, x 4) • Maintain record in register.	requirements. Practical Activity Perform sugar test on lime samples.		Filter Whatman paper Blotting paper Cylinder Flask phenolphthalein sulphuric acid.	
LU3. Carry out hydraulic acid test.	Trainee will be able to: • Identify the sample • Prepare the sample • Place the sample of specific quantity in the test-tube • Observe the efflorescence by adding HCL for 24 hours	• Differentiate between different classes of lime • Importance of Acid test for lime. • Explain flowing and non-flowing capability of gel. • Define Bubbling action. Practical Activity	Theory-01 Hrs Practice-02 Hrs Total- 2.5Hrs	Lime Water Lab sheet Proforma Hydraulic acid (HCL) Gel Test tube	Class Room/ Lab



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	- Observe the bubbling action of the reaction - Check the thick gel after 24 hours - Observe the flowing and non-flowing capability of gel. - Identify the class of the lime	Perform hydraulic acid (HCL) test on lime samples.			
LU4. Perform Impurity test.	Trainee will be able to: - Prepare the sample - Extract the residue from the solution - Observe the residue to dry under the sun for 8 hours - Observe the percentage of the residue left. - Identify the class of the lime	- Explain classes of lime. - Explain residues. Practical Activity Perform impurity test on lime samples.	Theory-0.5 Hrs Practice-02 Hrs Total- 2.5Hrs	Lime Water Lab sheet Proforma Filter Blotting paper Cylinder Flask	Class Room/ Lab
LU5. Maintain a safe work environment.	Trainee will be able to: - Use PPEs - Apply safe work practices - Rehabilitate sampling site - Minimize generation of wastes - Collect and dispose all waste - Clean and care all equipment. - Check serviceability of equipment	- Importance of PPEs processes. - Advantages of PPEs. - Importance of workplace safety. - Significance of safe work environment - Importance of maintaining the equipment after tests. Practical Activity - Prepare a PPEs plan in a lab to	Theory-0.5 Hrs Practice-2 Hrs Total- 2.5Hrs	Lab sheet proforma Lime samples Water Blotting paper Duster Grease	Class Room/ Lab



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	before storage.	maintain safe environment and place equipment in a proper sequence.			
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11.14.6 Perform Strength Test for lime

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, perform transverse strength test for lime, perform compressive strength for lime and maintain a safe work environment.

Duration: 20 Hours

Theory: 04 Hours

Practice: 16 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: • Access relevant job instructions from laboratory information management system (LIMS) • Interpret test request to confirm samples to be tested, the test method and equipment involved • Identify hazards to take sample • Prepare and workplace for task • Assemble / collect all required equipment and materials • Plan task / work sequences for optimum efficiency	• Introduce lab equipment use in chemical test for brick and block. • Explain LIMS • Selection of sample. • Explain in detail for proper utilization of workplace for task. • Introduction of work sequences to execute the task. Practical Activity Prepare a complete plan for executing a strength test of bricks and blocks.	Theory-01 Hrs Practice-04 Hrs Total- 05 Hrs	Performa sheet Equipment check list Duster Lubricating Oil	



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LU2. Perform transverse strength test for lime	Trainee will be able to: • Prepare sample: 25 x 25 x 100 mm mortar specimens • Mix: standard lime to sand at 1:3 ratio • Cure for 28 days with the mold with the help of a contained at 90 % relative humidity and a temperature of 27°C. • Remove the mold at the end of the 28 days and cure the specimen is cured in water for 30 minutes. • Test the specimen on a transverse testing machine, placing over 2 rollers placed at a space of 80mm. • Apply The concentrated load at the center uniformly at a rate of 150+_15N per minute till the specimen breaks. • Calculate The modulus of rupture or the transverse strength at 28 days. • Maintain record in register.	• Use of lime in construction • Difference between quicklime and hydrated lime • Specifications as per requirements • Modulus of rupture • Define co-efficient • Differentiate between transverse and compressive strength Practical Activity Perform transverse strength test for lime	Theory-01 Hrs Practice-04 Hrs Total- 05 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Lime Stone	
LU3. Perform compressive strength for lime	Trainee will be able to: • Prepare Twelve cubes with side 5 cm from standard lime-sand mortar using	• Introduction to Compressive / Crushing Strength test for samples. • Operations of Compressive /	Theory-01 Hrs Practice-04 Hrs Total- 05 Hrs	Sand Cement Lubricating	



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	metallic moulds. • Fill the moulds is filled by hand, the mortar being pressed in with the thumb, lightly tamped, smoothed off with 2 or 3 strokes of the trowel. • Store these cubes undisturbed in a container for a period of 72 hours in an atmosphere of at least 90 percent relative humidity and at a temperature of $27 \pm 20^{\circ}\text{C}$. for 72 hours. • Take out specimens and place in the air in laboratory for 4 days. • Immerse the samples in clean water and left there until just prior to testing for its strength in the testing machine. • Take out the cubes wiped surface-dry and test for compressive strength in a compression testing machine. The load is increased at a rate of 15kg/min. • Apply formula • Find out compressive strength • Maintain record in register.	impact tests. • Importance of Compressive / impact tests. • Techniques of Compressive / impact tests. • Types of lime and their properties. • Capacity of Crushing equipment / machine. • Measuring tools and techniques Practical Activity Perform compressive strength test of sample of lime.		oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Lime stone	
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LU4. Maintain a safe work environment	Trainee will be able to: • Use PPEs definitely • Apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect and dispose waste in accordance with environmental/quarantine requirements and workplace procedures • Clean all equipment • Check serviceability of equipment before storage	• Importance of PPEs processes. • Advantages of PPEs. • Importance of workplace safety. • Significance of safe work environment • Importance of maintaining the equipment after tests. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.	Theory-01 Hrs Practice-04 Hrs Total- 05 Hrs	Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts.	
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11.14.7 Perform Physical Test for Stones

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Perform (Porosity) Absorption & Moisture Content for stone samples, Perform durability test for stone samples, Perform **Attrition** /abrasion test for stone samples, Skid Resistance test for Stones and Maintain a safe work environments.

Duration:40 Hours

Theory: 08 Hours

Practice: 32 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from Laboratory Information Management System (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare workplace for task - Collect required equipment and materials - Plan task sequences for optimum efficiency	- Describe types of physical test. - Explain operations of physical tests. - Importance of physical tests. - Describe techniques of physical test. Practical Activity Prepare a complete plan for executing a strength test of bricks and blocks.	Theory-02Hrs Practice-05 Hrs Total- 07 Hrs		Class Room Lab



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LU2. Perform (Porosity) Absorption & Moisture Content for stone samples	Trainee will be able to: • Identify sample. • Weight the Sample • Dip sample in water for specified time • Differentiate sample weight. • Apply formula • Calculate percentage of absorption • Record test data in register.	• Describe capacity of physical test equipment. • Describe measuring tools and techniques • Describe sizes and uses stones in samples • Describe capacity of trolley / table • Describe weighing and dip techniques • Describe specifications as per requirements • Describe loading capacity of stones in equipment. Practical Activity Perform (Porosity) Absorption & Moisture Content for stone samples	Theory-02Hrs Practice-06Hrs Total- 08 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Stone	Class Room Lab
LU3. Perform durability test for stone samples	Trainee will be able to: • Identify sample. • Drop sample from specified height on hard surface • Differentiate sample. • Apply formula	• Describe type of different Stones and its properties • Define Porosity • Define Skid Resistance Practical Activity Perform durability test for stone	Theory-01Hrs Practice-06Hrs Total- 07 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil	Class Room Lab



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	• Calculate average for samples • Maintain record in register.	samples.		Sand Paper Brushes Nuts and Bolts. Stone	
LU4. Perform Attrition /abrasion test for stone samples	Trainee will be able to: • Identify samples in required numbers and weight. • Put sample in drum in specified numbers • Lock the Drum. • Check angle of inclination for drum • Rotate drum for specified revolutions and time. • Open Drum Safely • Clean &Weigh the samples • Apply formula • Compute result percentage. • Maintain Test record in register.	• Define different type of stones • Define soundness test • Importance of abrasion test for materials Practical Activity Perform Attrition /abrasion test for stone samples	Theory-01Hrs Practice-05Hrs Total- 06 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Stone	Class Room Lab



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LU5. Skid Resistance test for Stones	Trainee will be able to: • Select specimen • Prepare specimen testor • Adjust the specimen in the mould • Polish the specimen in machine • Place the sample in the skid resistance tester • Operate the tester • Compute the readings • Maintain Test record in note pad	• Explain skid resistance of stone. • Selection of appropriate sampling. • How to maintain test record. Practical Activity Perform Skid Resistance test of sample of Stone.	Theory-01Hrs Practice-05Hrs Total- 06 Hrs	Sand Cement Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts. Stone	Class Room Lab
LU6. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental/quarantine requirements and workplace procedures	• Describe importance of PPEs processes. • Describe advantages of PPEs. • Importance of workplace safety. • Describe significance of safe work environment • Importance of maintaining the equipment after tests. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and	Theory-01Hrs Practice-05Hrs Total- 06 Hrs	Lubricating oil Water Cloths Grease Kerosene oil Sand Paper Brushes Nuts and Bolts.	Class Room Lab



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	• Clean the equipment • Check serviceability of equipment before storage	place equipment in a proper sequence.			
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11.14.8 Perform Chemical Test of stones

Objective: This module covers the skills and knowledge required to carry out initial preparatory activities, perform chemical / efflorescence test for bricks and blocks (Soluble Salt Test), perform acid test for stones, perform crystallization test for stones, perform freezing and thawing test for stones, perform microscopic test for stones (Weathering Test), Perform microscopic test for stones, Perform smith test for stones and Maintain a safe work environment.

Duration: 37 Hours

Theory: 08 Hours

Practice: 29 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: • Access relevant job instructions from laboratory information management system (LIMS) • Interpret test request to confirm samples to be tested, the test method and equipment involved • Identify hazards to take sample • Prepare and workplace for task • Assemble / collect all required equipment and materials • Plan task / work sequences for optimum efficiency	• Introduce lab equipment use in chemical test of stones. • Explain LIMS • Selection of sample. • Explain in detail for proper utilization of workplace for task. • Introduction of work sequences to execute the task. Practical Activity • Prepare a complete plan for executing a chemical test of stones.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Lab sheets proforma	Class Room and Lab



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LU2. Perform Chemical / Efflorescence test for bricks and blocks (Soluble Salt Test)	Trainee will be able to: • Select sample. • Dip the brick / block in water for specified time. • Dry the sample in shade for specified time. • Check the color and surface after specified time • Check Randomly different samples • Maintain record in register.	• Introduction to Salt / Efflorescence test for bricks and blocks. • Explain operations of Salt tests. • Importance of Salt / Efflorescence tests. • Techniques of Salt / Efflorescence test. • Types of under burnt and over burnt bricks properties. • Capacity of Salt / Efflorescence test. • Sizes and uses of bricks in samples. Practical Activity Perform Chemical / Efflorescence test of bricks and blocks samples.	Theory-01Hrs Practice-03Hrs Total- 04Hrs	Bricks Water Lab Record sheet	Class Room and Lab
LU3. Perform Acid Test for Stones	Trainee will be able to: • Select sample. • Dip sample 5% Sulphuric Acid Solution for the specified time. • Dry the sample	• Describe weighing of stone sample techniques. • Describe specifications as per requirements • Importance of Acid test for	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Stones Sulphuric Acid Water Lab record	Class Room and Lab



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	• Check stone sample sharpness • Check Randomly different samples • Maintain record in register.	stones • Define PH value. Practical Activity Perform Acid Test of Stones samples.		sheet	
LU4. Perform Crystallization Test for Stones	Trainee will be able to: • sample. • Weight and dry the sample. • Dry the sample • Dip sample in 14% solution of Sodium Sulfate (Na₂SO₄) for specified time • Dry sample for specified temperature & weight. • Repeat test on sample for specified time • Apply formula • Compute result percentage • Maintain record as per S.O.P.	• Differentiate between Acid and Crystallization test of stones • Define impurities in stone • Importance of Crystallization test for stones. Practical Activity Perform crystallization test stones samples.	Theory-01Hrs Practice-03Hrs Total- 04Hrs	Stones Sodium Sulfate (Na₂SO₄) Water Lab record sheet Calculator Lab record sheet	Class Room and Lab
LU5. Perform freezing and thawing test for stones (Weathering Test)	Trainee will be able to: • Identify samples from different sources • Weigh the samples. • Immerse the samples in water • Store the immersed sample in freezer	• Define Freezing and Thawing. • Importance of weathering test of stone. • Explain process of freeze/thaw weathering	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Stones Water Lab record sheet Calculator	Class Room and Lab



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	• Dry sample in the drying chamber • Observe the change in weight • Observe the change in length • Compute the results • Maintain record as per S.O.P.	Practical Activity Perform freezing and thawing test for stones (Weathering Test)		Lab record sheet	
LU6. Perform microscopic test for stones	Trainee will be able to: • Sample. • Clean the sample. • Adjust sample under microscope • Observe the stone properties (Average size of grain, Reality of pores, cavity, fissures, veins and shakes, Mineral constituents, Nature of cementing material, Presence of any harmful substance, Texture of stones etc) • Maintain record as per S.O.P.	• Describe use of microscope • Define stone properties (Average size of grain, Reality of pores, cavity, fissures, veins and shakes, Mineral constituents, Nature of cementing material, Presence of any harmful substance, Texture of stones etc). Practical Activity • Perform microscopic test for stones	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Stones Water Lab record sheet Calculator Lab record sheet	Class Room and Lab



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LU7. Perform smith test for stones	Trainee will be able to: • Select sample. • Clean the sample. • Place a few chips / pieces of stone in a test tube. • Fill the test tube with water • Stir / shake the test tube vigorously • Observe sample after specified time • Observe Presence of earthy matter. • Maintain record as per S.O.P.	• Describe importance of smith test. • Difference between soluble and insoluble matter. Practical Activity Perform smith test of stones samples.	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Pieces of stones Test tube Water Lab record sheet Calculator Lab record sheet	Class Room and Lab
LU8. Maintain a safe work environment	Trainee will be able to: • Use PPEs • Apply safe work practices • Rehabilitate sampling site • Minimize generation of wastes • Collect and dispose all waste • Clean and care all equipment. • Check serviceability of equipment before storage.	• Describe importance of PPEs processes. • Describe advantages of PPEs. • Importance of workplace safety. • Significance of safe work environment • Importance of maintaining the equipment after tests. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Lab sheet proforma And equipment check list Duster	Class Room and Lab



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11.14.9 Perform Strength Test for stones

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Perform Crushing Strength test for stones), Perform Transverse strength test (Modulus of Rupture) for stones, Perform Hardness test for stones and Maintain a safe work environment.

Duration: 22 Hours

Theory: 06 Hours

Practice: 16 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from laboratory information management system (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare and workplace for task - Assemble / collect all required equipment and materials - Plan task / work sequences for optimum efficiency	- Introduce lab equipment use in chemical test of stones. - Explain LIMS - Selection of sample. - Explain in detail for proper utilization of workplace for task. - Introduction of work sequences to execute the task. Practical Activity - Prepare a complete plan for executing a crushing strength test, transverse test of stones, and hardness test.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Lab sheets proforma Equipment check list sheet	Class Room / Lab



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LU2. Perform Crushing Strength test for stones)	Trainee will be able to: • Sample. • Fill the Holes with prerequisite materials. • Dry the stone for specified time and temperature. • Apply Capping • Fix the stone in Compressive testing machine • Apply load at convenient rate on fixed sample. • Check crushing strength on gauge. • Maintain record in register.	• Introduction to Compressive / Crushing Strength test for samples. • Explain operations of Compressive / impact tests. • Importance of Compressive / impact tests. • Techniques of Compressive / impact tests. • Types of stone and their properties. • Capacity of Crushing equipment / machine. Practical Activity Perform crushing strength test of stone samples.	Theory-1.5 Hrs Practice-03 Hrs Total- 04.5Hrs	Stone Prerequisite material for hole filling Lab record sheet.	Class Room / Lab
LU3. Perform Transverse strength test (Modulus of Rupture) for stones	Trainee will be able to: • Select sample / specified specimen. • Fix sample wedge-shaped supports near its ends in the machine. • Apply load until failure at convenient specified rate.	• Describe measuring tools and techniques • Describe sizes and uses of stones in samples • Describe weighing of stone sample techniques.	Theory-1.5Hrs Practice-03 Hrs Total- 4.5 Hrs	Stone Prerequisite material for hole filling Lab record sheet.	Class Room / Lab



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	• Apply formula • Find out “Modulus of Rupture”. • Maintain record in register.	• Describe specifications as per requirements • Describe loading capacity of stones in equipment. • Define co-officiant Practical Activity Perform Hardness test of stone samples.			
LU4. Perform Hardness test for stones.	Trainee will be able to: • Select & weigh the sample. • Fix the sample on testing machine • Apply load at convenient rate on fixed sample. • Rotate machine for specified revolution and time. • Weigh the sample • Apply formula • Check co-officiant of hardness • Maintain record in register.	• Differentiate between Hardness and Crushing strength • Define different type of stones Different stone properties Practical Activity Perform Transverse strength test of stone samples.	Theory-01Hrs Practice-04 Hrs Total- 05 Hrs	Stone Prerequisite material for hole filling Lab record sheet.	Class Room / Lab



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LU5. Maintain a safe work environment	Trainee will be able to: • Use PPEs definitely • Apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect and dispose waste in accordance with environmental/quarantine requirements and workplace procedures • Clean all equipment • Check serviceability of equipment before storage	• Describe importance of PPEs processes. • Describe advantages of PPEs. • Importance of workplace safety. • Describe significance of safe work environment • Importance of maintaining the equipment after tests. Practical Activity • Prepare a PPEs plan in a lab to maintain safe environment and place equipment in a proper sequence.	Theory-01Hrs Practice-03 Hrs Total- 04 Hrs	Lab sheet proforma And equipment check list Duster	Class Room / Lab
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11.15 Testing Properties of Timber

11.15.1 Perform Strength Test on wood

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Perform compressive strength test on wood, Perform tensile strength test on wood, Perform flexural test on wood and Maintain a safe work environment

Duration: 33Hours

Theory: 5 Hours

Practice:28 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from laboratory information management system (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare and workplace for task - Assemble / collect all required equipment and materials - Plan task / work sequences for optimum efficiency	- Define to Compressive / Crushing Strength test for samples. - Explain Operations of Compressive tests. - State importance of Compressive, tensile and flexural tests. - Explain Types of wood and their properties. . Practical activity Carry out initial preparatory activities for timber testing in lab.	Theory-1Hrs Practice-3Hrs Total- 4Hrs		Class room and lab
LU2. Perform	Trainee will be able to:	Capacity of Crushing equipment /	Theory-1Hrs	Hand Trolley	Class



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compressive strength test on wood	• Select samples. • Clean wood sample. • Fix the wood sample in Compressive testing machine ○ samples parallel to grain, ○ samples perpendicular to grain • Apply load at convenient rate on fixed sample. • Check crushing strength on gauge. • Plot stress strain curve • Check the failure mode • Maintain record in register	machine. • Describe measuring tools and techniques • Describe sizes and uses of wood in samples • Describe weighing of wood sample techniques. • Describe specifications as per requirements • Define compressive strength. Practical activity Perform compressive strength test on wood samples (teak, shisham and deodar) in lab.	Practice-9Hrs Total-10Hrs	Cutter Saw Compressive Testing Machine Measurement tape Gauge File set	room and lab
LU3. Perform tensile strength test on wood	Trainee will be able to: • Select and clean samples. • Identify equipment's for test. • Fix the wood sample in universal testing machine 1 - samples parallel to grain, 2- samples perpendicular to grain) • Apply load at convenient rate on fixed	• Explain procedure of tensile strength test . • Define tensile strength. Practical activity Perform tensile strength test on wood samples (teak, shisham and deodar) in lab.	Theory-1Hrs Practice-9Hrs Total-10 Hrs	Hand Trolley Cutter Saw Measurement tape Gauge File set Universal Testing Machine	Class room and lab



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	sample. • Check tensile strength on gauge. • Plot stress strain curve • Check the failure mode • Maintain record in register				
LU4. Perform flexural test on wood	Trainee will be able to: • Select and clean samples. • Identify equipment's for test. • Fix the wood sample in machine • Apply load at convenient rate on fixed sample. • Calculate flexural strength • Maintain record	• Explain the flexural test procedure. • Define flexural strength Practical activity Perform flexural test on wood samples (teak, shisham and deodar) in lab	Theory-1Hrs Practice-6Hrs Total-7Hrs	Hand Trolley Cutter Saw Measurement tape Gauge File set 3-Point Bending Apparatus	
LU5. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental / quarantine requirements and workplace	• Knowledge of tools and equipment • Cleaning techniques. Practical activity Maintain a safe work environment in lab	Theory-1Hrs Practice-1Hrs Total-2Hrs	Cleaning tools and equipment	



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	procedures • Clean the equipment • Check serviceability of equipment before storage				
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11.15.2 Determine hardness and impact timber

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Determine hardness of timber, Perform impact test on timber (charpy impact test) and maintain safe environment

Duration: 22 Hours

Theory: 3 Hours

Practice: 19 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Access relevant job instructions from laboratory information management system (LIMS) - Interpret test request to confirm samples to be tested, the test method and equipment involved - Identify hazards to take sample - Prepare and workplace for task - Assemble / collect all required equipment and materials - Plan task / work sequences for optimum efficiency	- Define wood - Explain Constructional wood (timber) with sketch - Explain structure and growth of timber. - Explain wood types and Uses of various wooden products - Felling and conversion of timber. - Defects and decay of timber. - Qualities-characteristics, section of timber Practical activity Carry out initial preparatory activities in lab.	Theory-1Hrs Practice-3Hrs Total-4Hrs	File	Class room and lab
LU2. Determine hardness of timber	Trainee will be able to:	Describe Specifications for the	Theory-0.5Hrs	Digital weighing	Class room and



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	- Identify tools and equipment - Clean the sample - Measure dimensions of sample - Calibrate the apparatus. - Fix the timber sample in apparatus. - Adjust the jack so that surface touches the indenter. - Apply load at constant rate with help of apparatus. - Repeat the procedure for radial surface. - Calculate hardness of timber by taking average.	test. Define hardness of timber. Practical activity Perform flexural test on wood samples (teak, shisham and deodar) in lab	Practice-6Hrs Total-6.5Hrs	balance Janka ball indenter with dial gauge	lab
LU3. Perform impact test on timber (charpy impact test)	Trainee will be able to: - Identify tools and equipment. - Weigh sample - Measure the sample with vernier caliper - Set the latching mechanism in upper position - Record the air friction and friction at bearing - Fix the sample in apparatus. - Horizontally across supports - Vertically across supports - Slide the pointer to its maximum energy on scale. - Raise the pendulum arm until it is firmly	- Describe the Specifications for the test. - Explain the importance of impact resistance. - Define impact resistance. Practical activity Perform impact test on timber (teak, shisham and deodar) in lab. (charpy impact test)	Theory-1Hrs Practice-9Hrs Total-10Hrs	Digital weighing balance Vernier caliper Pendulum type single blow impact testing machine	Class room and lab



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	supported by machine. • Release pendulum arm. • Apply hand brake. • Record the reading on charpy scale. • Calculate impact strength.				
LU4. maintain safe environment	Trainee will be able to: • Use PPEs and apply safe work practices • Rehabilitate sampling site and Minimize generation of wastes • Collect waste material • Dispose waste Material in accordance with environmental / quarantine requirements and workplace procedures • Clean the equipment • Check serviceability of equipment before storage	• Explain the knowledge of tools and equipment used Practical activity Maintain safe environment in lab.	Theory-0.5Hrs Practice-1Hrs Total-1.5 Hrs	Cleaning tools and equipment	



11.15.3. Determine properties and types of locally manufactured timber

Objective: This module covers the skills and knowledge required to Prepare Samples for Petrography, Perform the Gradation Test, Compute the Specific Gravity, Unit weight and Optimum Moisture content of the aggregate, Carry out Clay Lumps and Friable Particles Test, Perform the Soundness Test , Perform Flaky & Elongated Particles test , Perform the Los Angeles Abrasion Test for A & B class Material, Perform the Aggregate Impact Value Test and Execute the Aggregate Crushing Value Test.

Duration: 14 Hours

Theory: 3 Hours

Practice: 11 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify type of timber	Trainee will be able to: • Recognize color and odor of locally produced timber • Prepare a list of locally produced timber in accordance with color and odor • Identify type of given timber sample	• Define wood • Explain Constructional wood (timber) with sketch • Explain structure and growth of timber. • Explain wood types and Uses of various wooden products • Felling and conversion of timber. • Defects and decay of timber. • Qualities-characteristics, section of timber Practical activity Identify type of timber in lab.	Theory-1Hrs Practice-3Hrs Total-4Hrs	PPEs File	Class room and lab



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LU2. Determine specific gravity of timber	Trainee will be able to: • Identify tools and equipment • Measure dimensions of sample • Weigh sample • Calculate specific gravity of timber by computing density	• State the characteristics of timber. • Define specific gravity • Explain the procedure of specific gravity test. • Define seasoning and its types. • Explain importance of seasoning. Practical activity Determine specific gravity of timber in lab.	Theory-1Hrs Practice-2Hrs Total-3Hrs	PPEs File with record sheet Weighing balance Container Brush /cleaning tool	Class room and lab
LU3. Find out moisture content of timber	Trainee will be able to: • Identify tools and equipment • Weigh sample before oven drying • Weigh sample after drying sample • Calculate moisture content	• Describe the test procedures for moisture content of timber. • Define moisture content and OMC of timber Practical activity Find out moisture content of timber in lab	Theory-0.5Hrs Practice-3Hrs Total-3.5 Hrs	record sheet weighing balance Laboratory oven moisture meter	Class room and lab
LU4. Determine compressive strength of timber	Trainee will be able to: • Identify tools and equipment • Assemble sample in equipment by placing sample perpendicular to grain • Find out compressive strength according to specification • Repeat process by placing sample parallel to grain	• Describe the Specifications for the compression test. Practical activity Determine compressive strength of timber (deodar and shisham) in lab.	Theory-0.5Hrs Practice-3Hrs Total-3.5 Hrs	Compression testing machine Ply wood Vernier caliper Digital weighing balance record sheet	Class room and lab



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	• Interpret compressive strength				
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11.15.4 Make simple calculations of timber

Objective: This module covers the skills and knowledge required to Prepare a drawing of product and Estimate timber quantity

Duration: 11Hours

Theory: 2 Hours

Practice: 9 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare a drawing of product	Trainee will be able to: - Identify drawing tools - Perform basics of drawing - Draw plan, cross section and elevation of product	- Describe measuring of wood square and board - Describe measuring of Log - Description and use of drawing tools Practical activity Prepare a drawing of wood log lab.	Theory-2Hrs Practice-6Hrs Total-8Hrs	Drafting table Drafting tools Drawing sheet Measuring tape	Class room and lab
LU2. Estimate timber quantity	Trainee will be able to: - Identify components of product - Recognize timber requirement for specific components of product - Calculate quantities of timber	Practical activity Estimate the quantities of wood log in lab.	Theory-0 hrs Practice-3Hrs Total-3Hrs	PPEs File with record sheet Measuring tape	Class room and lab



12. List of Tools, Equipment and Consumable

Soft Skills			
S#	Tools and Equipment	S#	Consumable Material
1	Calculator	1.	Pencil
2	Ruler	2.	Eraser
3	Drawing lab equipment		

Construction Practices II

S#	Tools and Equipment	S#	Consumable Material
1.	Brick Making Machine	1.	Sand
2.	Brick Molds	2.	Sand Dust
3.	Hand roller	3.	cement
4.	Thermometer	4.	self-tapping screws
5.	Umbrella with stand	5.	soft sheet nails
6.	PPEs	6.	Wall board adhesive
7.	Calculator	7.	Distemper
8.	Stone masonry instruments	8.	Brick Ballast
9.	Scissor	9.	Lime
10.	Mason Trowel	10.	Paint
11.	Pointing Trowel	11.	Thermophore for Joints 2" & 1" thick
12.	Troweling Blades	12.	Water Stopper for Concrete (Plastic)
13.	Hammer	13.	Lime Color (Different)
14.	Hammer Forged steel rectangle head	14.	Road Metals
15.	Lump hammers	15.	Chalk
16.	Hammers (bricks, club and scutch)	16.	Luminous Slip
17.	Sledge hammers	17.	Stone Crush
18.	Air compressors and hoses	18.	Lime beds



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19.	Bevels	19.	Pencil,
20.	hand/power saws	20.	Eraser,
21.	Core cutting saw	21.	Sharpener,
22.	Jig saws	22.	Drawing sheet,
23.	Masonry saws	23.	Acoustic underlay material, adhesives
24.	Wet and dry diamond saws	24.	Caulking compound, cement mortar (with and without additives)
25.	Marking equipment	25.	Clouts, cornice adhesive, crack suppression membrane
26.	Measuring tapes and rules,	26.	Fixings and fasteners
27.	Metallic Tape 100 feet (30m)	27.	Patching materials, plasterboard nails, pre-mixed and mixed fillers
28.	Steel Tape- Slide Lock, Automatic Returns, Metallic / plastic case, 5-meter, Graduation on both side in feet & meter	28.	
29.	Measuring scale,		
30.	Nail guns		
31.	Protractors		
32.	squares (combination/tri)		
33.	steel squares and fences		
34.	string lines		
35.	Line blocks and line pins		
36.	builders' lines		
37.	static lines		
38.	Compass		
39.	Corner Float and float Blades		
40.	Steel float Set (Small, medium, large) Wooden Handle		
41.	Wooden Float (Small, medium, large) Wooden Handle		
42.	Groove Cutter		
43.	Cement sheet cutters		
44.	Tile cutters		
45.	Edger		



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46.	Brooms		
47.	Polishers		
48.	Hand Grinders		
49.	Power grinders		
50.	Vibrator		
51.	Vibrating Rod		
52.	Form work		
53.	Molds		
54.	Workability test apparatus		
55.	Core cutting machine		
56.	Hand Drill Machines with drills		
57.	Power drill machines with drills		
58.	Sheet plate		
59.	Plate bar		
60.	Plate rod		
61.	Adjustable base plates		
62.	Channels		
63.	Forgings area		
64.	Casting platform		
65.	Furnace		
66.	Wheel Barrow:		
67.	Bucket		
68.	Paint Scraper Set		
69.	Potien Filler Knife Set		
70.	Chisel Set (9"-12"-18")		
71.	Plumb Bob		
72.	plumb rules		
73.	Straight Edge		



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74.	Shovels with handle		
75.	Kassi (Plies) with handle		
76.	Spirit Level (Aluminum 2 ft. length)		
77.	torpedo levels		
78.	Dumpy Level		
79.	Pick Axe		
80.	Tray (Galvanized Iron, 14 SWG) SET		
81.	Pointing Tray		
82.	Striker for vertical joint (pointing)		
83.	Striker for horizontal joint (pointing)		
84.	Bamboo (10 feet)		
85.	Bamboo (15 feet)		
86.	Battens (5'x3½"x2½")		
87.	Shesham Wood Planks (7'x7"x1½")		
88.	Mortar Pan -GI Sheet (20 SWG) Size, 45 cm dia		
89.	mortar boards		
90.	Adjustable Wrench Set- * Hardened Steel, tempered and chrome plated, * Set include 8" (20cm), 12" (30cm), 18" (45cm)		
91.	Mixing Spoon Set- heavy gauge stainless steel, 150mm, 200mm, and 250mm long, round bottom		
92.	Concrete mixers		
93.	Elevators		
94.	Forklifts		
95.	jointing tools		
96.	Margin or raking tools		
97.	materials hoists		
98.	Cantilevered hoists (materials only with maximum capacity of 500kg)		
99.	Wall Scaffolds		
100.	scaffold belts		



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101.	scaffolding planks		
102.	bracket scaffolds (tank and formwork)		
103.	prefabricated scaffolds		
104.	braces		
105.	small petrol or diesel engines and compressors,		
106.	Bolsters		
107.	brick buggies		
108.	brick grabs		
109.	Bends and hitches		
110.	box spanners		
111.	Couplers and accessories		
112.	Fiber ropes		
113.	Gin wheels		
114.	guard rails		
115.	Ledgers		
116.	Mesh guards		
117.	mid rails		
118.	modular and prefabricated components		
119.	Safety nets		
120.	Stairs or ladders		
121.	Standards		
122.	steel and aluminum tubes (pipes)		
123.	transoms		
124.	Wire nips		
125.	Pallet trolleys		
126.	profiles		
127.	Brushes		
128.	Caulking guns		



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129.	Electrical leads		
130.	Hose and water sprays		
131.	Nippers		
132.	Pointed grouters		
133.	power screwdrivers		
134.	sanders		
135.	Rags		
136.	rubber mallets		
137.	Sanding blocks		
138.	spacers and wedges		
139.	Spatulas		
140.	sponges, squeegees		
141.	wire brushes,		
142.	Work platforms		
143.	scribes		

Concrete Testing

S#	Tools and Equipment	S#	Consumable Material
1.	Compression Testing Machine	1.	Cement
2.	Flexure / Tension Machine (cement Mortar Briquette Tensile Testing	2.	Sand
3.	Electronic Digital Balance (Top-Pan Type)	3.	Aggregates of sizes
4.	Electronic Digital Precision Balance (Top-Pan Type)		
5.	Top Pan Weighting Balance		
6.	Buoyancy Balance, 6000g x 0.1 g, ASTM C 127		
7.	Vicat Apparatus		
8.	Lechatlier's Apparatus complete set for soundness		
9.	LE CHATELIER FLASK, ASTM C188; BS 4550 for relative density of cement.		



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10.	Sand Equivalent Apparatus ASTM D 2419		
11.	Digital Stop Watch		
12.	Planetary Mixer, ASTM C 305		
13.	Desiccators cabinet		
14.	Specific Gravity Test Set		
15.	Set of Sieve		
16.	Sieve shaker		
17.	Non-Distractive Test (Concrete Test Hammer)		
18.	Flakiness Sieve Set		
19.	SPATULA		
20.	Wire Brush for clearing modules		
21.	Trimming Knife		
22.	Graduated Cylinders		
23.	Flakiness Index Gauge		
24.	Elongation index gauge (length gauge)		
25.	Wire Basket		
26.	Tray (Galvanized Iron, 14 SWG) SET		
27.	Pycnometer		
28.	Conical Flask		
29.	Beakers		
30.	Thermometers		
31.	Wash Bottle (Plastic 250 ml capacity)		
32.	Specific Gravity Bottles (25ml)		
33.	Metallic Scoops		
34.	Mortar & Pestle		
35.	Mixing Spoon Set		
36.	Mixing Bowl		
37.	Rebar Locator Apparatus		



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38.	Concrete Drum Mixer (Tilting Type)		
39.	Platform scale		
40.	MOULDS: - cubes 150mm (6") with clamp attached based plate, easily collapsible sides (made of cast iron)		
41.	cubes 100mm (4") with clamp attached based plate, easily collapsible sides (made of steel)		
42.	cylinders 150mm dia X 300mm height (6" dia x 12" height) complete with base plate and locking arrangement, made of Steel		
43.	mortar cubes 50mm (2") made of brass / steel, three gang mould, machined in internal surfaces, easily collapsible		
44.	beams 150 x 150x600mm (6"x6"x24") made of steel		
45.	Set of Spanners for (cubes and cylinder, beam moulds)		
46.	Tamping Rod for cubes/cylinders 16 mm dia 600 mm long ASTM		
47.	Tamping Rod for mould, 25 x 25 x380 mm (BS 1881)		
48.	Concrete cylinder capping complete including: a. two steel retainers for 6" (15cm) dia cylinders, b- Electric melting pot for melting capping compound (with		
49.	20kg capping compound Tin)		
50.	Vibrating Table		
51.	Poker Vibrator		
52.	Slump Test Apparatus		
53.	Compacting Factor Apparatus		
54.	Mechanical Sieve Shaker		
55.	Wheel Barrow:		

Soil Testing

S#	Tools and Equipment	S#	Consumable Material
2	Empty clean container	1.	Soil samples



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3	Oven	2.	clean dry sand passing from No.10 (2.0mm) sand retained on No.20 (850mm) sieve
4	Balance accurate to 0.01gm	3.	Paper
5	Speedy moisture tester	4.	Drafting table
6	Steel ball of 1.25 Inch diameter	5.	Pencil
7	Brush for cleaning the tester	6.	Ruler
8	Scoop for measuring Calcium carbide reagent	7.	Rubber
9	Pycnometer of about 1liter capacity	8.	Sharpener
10	Glass rod	9.	Masking tape
11	Vacuum pump		
12	Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200		
13	lid and pan		
14	Sieve shaker		
15	Soft brush for cleaning		
16	Evaporating dish		
17	No. 40 sieve with lid and pan		
18	Standard proctor Test Apparatus with rammer of 2.5Kg (5.5 lb) of fall 25.4Cm (12")		
19	Balance 5 kg capacity		
20	GI Sheet Tray		
21	Standard proctor Test Apparatus with rammer 4.54Kg (10 lb), of fall 38Cm (18")		
22	sieve 19 mm (3/4") and 9.5mm (3/8")		
23	straight edge		
24	Apparatus Core cutter		
25	Hammer		
26	excavating tools		
27	Sand Cone Apparatus		
28	calibrating container		
29	Spoon		
30	Ladle		



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31	Spade		
32	Trowel		
33	Beater		
34	Drawknife		
35	Sample Bags Chisel		
36	Flat Scoop		
37	Small Curve Scoop		
38	Medium Curve Scoop		
39	Large Curve Scoop		
40	Flat Brush		
41	Canvas 2 X 2 M.		
42	glass plate		
43	Constant head Permeameter device (including constant head filter tank and manometer tubes)		
44	Graduated Cylinder 1000 MI Capacity		
45	Graduated Cylinder 2000 MI Capacity		
46	500 ml beaker		
47	1000 ml beaker		
48	Vernier Caliper		
49	Desiccator		
50	Canvas Gloves		
51	Gloves, Latex Rubber		
52	Plastic Bottle, Cap. 2 L.		
53	Plastic Bottle, Cap. 5 L.		
54	Rubber Bucket, Cap. 12 L.		
55	Rubber Bucket, Cap. 18 L.		
56	Stainless Steel Bowls		
57	Steel Hammer		
58	Pick Hammer		



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59	Rubber Hammer		
60	Stop watch		
61	Thermometer		
62	Apparatus Falling head Permeameter device		
63	Ring stand with test tube clamp		
64	Burette (100ml)		
65	Shear box		
66	Shear box container		
67	Base plate with cross groves on its top		
68	Porous stones (2 Nos)		
69	Plain Grid plates (2Nos)		
70	Perforated grid plates (2Nos)		
71	Loading pad with steel ball		
72	Digital weighing machine		
73	Loading frame with loading yoke		
74	Proving ring		
75	Dial gauges (2 Nos)		
76	Weights		
77	Tampering Rod		
78	Spatula		
79	Triangle Spatula		
80	Sampler		
81	Distribution Panel		
82	Automatic Pressure/Volume Controllers		
83	Load Frame		
84	Load Cell		
85	Displacement transducer		
86	Tri axial Cell		



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87	Pore Pressure Transducer		
88	De-aired water supplier		
89	Data logger		
90	Sample extruder		
91	Sample moulds		
92	Membranes		
93	'o' rings		
94	Porous discs		
95	Ruler		
96	Filter papers		
97	Drilling Rig.		
98	Split spoon (tube).		
99	Drop hammer		
100	Driving head (anvil).		
101	Guiding rod.		
102	Tripod.		
103	Extension rods		
104	Cylindrical mould		
105	detachable extension collar		
106	detachable perforated base plate		
107	Spacer disc		
108	Metal rammer		
109	Loading frame		
110	Metal penetration piston		
111	Two dial gauges reading to 0.01 mm.		
112	Sieves. 4.75 mm and 20 mm I.S. Sieves		
113	mixing bowl		
2	scales soaking tank or pan		



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Water and Waste Water Testing

S#	Tools and Equipment	S#	Consumable Material
1.	Dissolved Oxygen meter and sensor		Eraser
2.	Turbidity meter		Pencil
3.	Litmus Paper		
4.	Spectrophotometer		
5.	Thermometer		
6.	Containers		
7.	Sound level meter		
8.	Charts		
9.	Ear Muff, Ear Plug		
10.	Safety shoes		
11.	Gloves		
12.	Safety Goggles		
13.	Safety Helmet		
14.	Respiratory protective equipment i.e. Masks		
15.	Life Jacket		
16.	High visibility jacket		
17.	Safety harness		
18.	Face shield		
19.	Rubber shoes/ long shoes		
20.	Water Buckets		
21.	Fire Blankets		
22.	Sand Buckets		
23.	First Aid Box		
24.	Thermometer and B.P apparatus		
25.	Fire Extinguisher		



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26.	Fire Alarm		
27.	Sprinklers		
28.	Computer system		

13. Members of Curriculum Development Committee

The following members participated in the Curriculum development Committee:

S#	Name	Designation	Organization
1	Engr. Azhar Iqbal Shad	Chief Instructor (Civil)	GCT Raiwnd Road, LHR
2	Mr. Imtiaz Ahmed Awan	Sr. Instructor (Civil)	GCT Rasul (Mandi Bahauddin)
3	Mr. Muhammad Amjad Rafique	Sr. Instructor (Civil)	GCT Rasul (Mandi Bahauddin)
4	Mr. Nadeem Zaigham	Sr. Instructor (Civil)	GCT Raiwnd Road, LHR
5	Mr. Tahir Mahmood	Sr. Instructor (Civil)	GTTI Mughalpura Lahore
6	Engr. Norheen Amina	Consultant	Allied Engineering Services Lahore
7	Engr. Hira Ishtiaq	Consultant.	Allied Engineering Services Lahore
8	Engr. Habiba Mohsin	Design Engineer	JERS Engineering Consultants Lahore
9	Engr. Rebab Maria Mahmood	Site Engineer	IMC Lahore/ Industry
10	Engr. Arsalan Hameed Khan	Assistant Manager (Project)	Planning & Project department Lahore Waste Management Company.
11	Engr. Muhammad Usamn Hayder	Project Manager	Muzaffar Sons Construction Private Lahore
12	Engr. Inayat-ur-Rehman	DACUM, Facilitator	Peshawar
13	Mr. Muhammad Ishaq	Director HR	NAVTTC, Islamabad