



**GOVERNMENT OF TAMILNADU**  
**DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI**  
**STATE PROJECT COORDINATION UNIT**  
**(Established under Canada India Institutional Cooperation Project)**  
**CURRICULUM**

| Course Name                  | HEAVY MACHINERIES OPERATIONS & MAINTENANCE<br>(BACK HOE LOADER - JCB)   |
|------------------------------|---|
| Course Code                  | ME /2020/016  |
| Course Duration              | 60 Hours  |
| Minimum Eligibility Criteria | 8th Std   |
| Prerequisites (if any)       | -   |
| Course Objectives            | Training module has been designed for the participants to <ul style="list-style-type: none"> <li>• Understand the Hydraulic system.</li> <li>• Understand the Fuel system.</li> <li>• Understand the Electrical system.</li> <li>• Understand the Transmission system.</li> <li>• Appreciate the safety practices.</li> </ul> |
| Course Outcomes              | At the end of training, the participants will be able to <ul style="list-style-type: none"> <li>• Inspect the machine periodically.</li> <li>• Start and operate the engine.</li> <li>• Operate various lever in the JCB.</li> <li>• Maintain and operate heavy machineries (JCB).</li> </ul>                                 |
| Expected Job Roles           | Back Hoe Loader Operator & Maintenance Technician   |

| TEACHING AND SCHEME OF EXAMINATION |   |           |    |                  |     |                             |
|------------------------------------|---|-----------|----|------------------|-----|-----------------------------|
| Course Code                        | Course Name   | Hours     |    | Assessment Marks |     | Duration of the Examination |
|                                    |   |           |    | Min              | Max |                             |
| ME /2020/016                       | <b>HEAVY MACHINERIES OPERATIONS &amp; MAINTENANCE<br/>(BACK HOE LOADER - JCB)</b> | Theory    | 20 | 10               | 20  | 3 hours                     |
|                                    |   | Practical | 40 | 40               | 80  |                             |
|                                    |   | Total     | 60 | 50               | 100 |                             |

**ME /2020/016 - HEAVY MACHINERIES OPERATIONS & MAINTENANCE(BACK HOE LOADER - JCB)**  
**DETAILED SYLLABUS**

| Unit No.   | Modules   | No. of Hours    |           |
|------------|---|-----------------|-----------|
|            |   | Theory          | Practical |
| <b>I</b>   | <b>Machine parts and CAB features</b>   | <b>14 Hours</b> |           |
| 1.1        | Introduction to the Machine: Parts – General Information, Hydraulic System – Oil Tank System – Pump System – Types of Valves – Cylinder – Hydraulic Motor – Hydraulic Circuit Suction Stroke. Engine and Engine Parts Details: Engine – Parts – Fuel System – Power System.   | 08              |           |
| 1.2        | <b>Practical:</b><br>Operation Station<br>CAB Features - Monitor Panel & Switch Panels - Engine oil Pressure - Coolant Temperature - Fuel Gauges & Hour Meter - Light & Key Switch.   |                 | 06        |
| <b>II</b>  | <b>Transmission System, Machine inspection</b>  | <b>12 Hours</b> |           |
| 2.1        | Transmission System – Wheel and Column System – Front and Wheel System<br>Drive Axle: Drive Axle Assembly Unit – Differential Systems.  | 04              |           |
| 2.2        | <b>Practical:</b> <ul style="list-style-type: none"> <li>➤ Name and Function of Components of the machine</li> <li>➤ Pre-Start Inspection                             <ol style="list-style-type: none"> <li>1. Inspect Machine daily before start</li> <li>2. Electrical, Fuel &amp; hydraulic system</li> <li>3. Boom, Sheet metal tracks &amp; Lubrication.</li> </ol> </li> </ul> |                 | 08        |
| <b>III</b> | <b>Hydraulic circuits</b>   | <b>20 Hours</b> |           |
| 3.1        | Oil Operating System: Oil Operating System – Hydraulic oil and circuits – Brake and break Circuits.   | 04              |           |
| 3.2        | <b>Practical:</b><br><b>Operation</b><br>Starting the engine - Careful operation - Levers operation.  |                 | 16        |
| <b>IV</b>  | <b>Safety aspects</b>   | <b>8 Hours</b>  |           |
| 4.1        | Safety: Protective Clothing – Prepare for Emergencies – Inspect Machine- Keep Riders off Machine – Avoid Power lines- Move and Operate Machine Safely – Basic Traffic rules with road signals   | 02              |           |
| 4.2        | <b>Practical:</b> <ul style="list-style-type: none"> <li>➤ Driving the Machine</li> </ul>   |                 | 06        |

| V                                | Machine Maintenance   | 6 Hours |    |
|----------------------------------|---|---------|----|
| 5.1                              | Importance of Machine Maintenance.                                  | 02      |    |
| 5.2                              | Practical:<br>➤ Maintenance aspects of various parts of the machine |         | 04 |
| Total Theory and Practical hours |   | 20      | 40 |
| Total hours                      |   | 60      |    |

#### HARDWARE REQUIREMENT

| S. NO. | LIST OF TOOLS /EQUIPMENTS                          |
|--------|--|
| 1.     | Open End, Closed end, combination Spanners         |
| 2.     | Adjustable Spanner                                 |
| 3.     | Socket set, Tubular Spanner                        |
| 4.     | Cutting Pliers, Circlip Pliers                     |
| 5.     | Screw Driver set, Files, Hacksaw frame and Hacksaw |
| 6.     | Torque Wrench                                      |

#### REFERENCE BOOKS

| S. NO. | NAME OF THE BOOK                          | AUTHOR   | PUBLISHER   |
|--------|---|--|---|
| 01     | Construction Equipment Management         | John E. Schaufelberger and Giovanni C. Migaliaccio | Routledge, New Delhi                              |
| 02     | Construction Equipment Guide              | David A. Day and Neal B.H. Benjamin                | John Wiley & Sons, New Jersey                     |
| 03     | Hydraulic Systems for Mobile Equipment    | Timothy W. Dell                                    | Goodheart-Willcox Company, USA                    |
| 04     | Backhoe Loader operator facilitator guide | ---  | Infrastructure Equipment Skill council, Bangalore |

### ASSESSMENT AND CERTIFICATION

| S. No. | Criteria for Assessment  |
|--------|--|
| 1.     | A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours  |
| 2.     | A trainee must have 75% of attendance to appear for End examination in Theory and Practical.   |
| 3.     | The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)   |
| 4.     | The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic. |
| 5.     | The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.   |
| 6.     | On successful completion of training , Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.  |

### END EXAMINATION

#### ALLOCATION OF MARKS

| S.NO        | Description                 | Max.Marks |
|-------------|-----------------------------|-----------|
| 1.          | Theory Examination          | 20        |
| 2.          | Practical Examination       |           |
|             | a)Aim and Procedure         | 20        |
|             | b)Demonstration / Execution | 25        |
|             | c) Result & Viva Voce       | 15        |
|             | d)Record                    | 20        |
| Total Marks |                             | 100       |

## THEORY QUESTION PAPER

ME/2020/016 – HEAVY MACHINERIES OPERATIONS & MAINTENANCE  
(BACKHOE LOADER – JCB)

(Maximum marks: 20)

(N.B: Answer any **Twenty** questions)

**20x1=20 Marks**

1. Write any two parts of hydraulic system.
2. Write any two types of pump.
3. Name any two types of valves.
4. Write any two use of IC engine.
5. What are the fuels used for IC engine?
6. What is meant by gearbox?
7. Write any two types of clutch?
8. What is use of differential?
9. Write any two parts of drive axle.
10. Write types of gears used in differential.
11. What is meant by hydraulic oil circuits?
12. Write any two parts of brake system.
13. How do we check air pressures of tyre?
14. How do we check oil level?
15. Write any two road signal.
16. What is use of protective clothing
17. Write any two switches in control panel.
18. Write any two type of lever.
19. What is steering wheel?
20. How many lever used to operate loader?
21. What is use of stabilizer legs?
22. What is loader?
23. What is boom cylinder?
24. What is the use of bucket cylinder?
25. Write any two gauge/meter on control panel.