



# **CURRICULUM**

## **CONSTRUCTION MACHINERY OPERATOR (3 months course)**

**PROJECT OF SUPPORT TO THE PRIME MINISTER'S  
PROGRAMME FOR SKILLS TRAINING**

**International Labour Office for Pakistan, ILO Building, Sector G-5/2, Islamabad**

## Foreword

Skills development in Pakistan serves as an essential tool in developing the skills and employability of men and women in urban & rural areas, and hence helps in reducing poverty. The Prime Minister in his speech at the Employment and Skills Forum also stressed on the importance of improving the skills and employability of people. Skills development is a key component of Pakistan's Decent Work Country Programme.

Under the preparatory phase of "Project of Support to the Prime Minister's Programme for Skills Training", assessment of the capacities of training institutions was carried out to deliver short demand-driven courses to young people, mostly from poverty-stricken rural and urban areas. In addition to a major assessment of training institutions, the project provided for capacity-building of senior staff and instructors from training institutions. Four workshops of one week each were organized at Peshawar, Karachi, Multan and Lahore, as a result of which 53 curricula documents were developed. The workshops also provided training and information on a number of different approaches to career guidance & vocational counseling, quality assurance and introduction of competency-based skill standards.

At the completion of each workshop, a selected number of participants were requested to return to their institutions and prepare relevant training manuals within 3-4 weeks time. The content and relevancy of training manuals developed is appropriate, however much hard work has gone into their preparation.

I would like to take this opportunity to express my deep appreciation to UNDP for its support and financial assistance. I would also like to thank the project team led by Trevor Riordan, Project Director and Manzoor Khaliq, Senior Programme Officer. Special thanks to the consultant, Ian Sam Cummings and Muhammad Muneer, Project Support Officer who jointly organized and conducted the workshops.

It has been an excellent team effort in joint collaboration with the Ministry of Labour and Manpower, National Training Bureau, Provincial Departments of Labour/Directorates of Manpower & Training and TEVTA Punjab.



This particular Curriculum was prepared by Muhammad Iqbal Gandapur, Lecturer, Government College of Technology D.I. Khan, Directorate of Technical Education and Manpower Training Peshawar.

Donglin Li  
Director ILO  
Pakistan

Under the preparatory phase of "Project of Support to the Prime Minister's Programme for Skills Training", assessment of the capacities of training institutions was carried out to deliver short demand-driven courses to young people, mostly from poverty-stricken rural and urban areas. In addition to a major assessment of training institutions, the project provided for capacity-building of senior staff and instructors from training institutions. Four workshops of one week each were organized at Peshawar, Karachi, Multan and Lahore, as a result of which 23 curricula documents were developed. The workshops also provided training and information on a number of different approaches to career guidance & vocational counselling, quality assurance and introduction of competency-based skill standards.

At the completion of each workshop, a selected number of participants were requested to return to their institutions and prepare relevant training manuals within 3-4 weeks time. The content and relevancy of training manuals developed is appropriate, however much hard work has gone into their preparation.

I would like to take this opportunity to express my deep appreciation to UNDP for its support and financial assistance. I would also like to thank the project team led by Trevor Rindard, Project Director and Manzoor Khalid, Senior Programme Officer. Special thanks to the consultant, Ian Sam Cummings and Muhammad Munir, Project Support Officer who jointly organized and conducted the workshops.

It has been an excellent team effort in joint collaboration with the Ministry of Labour and Manpower, National Training Bureau, Provincial Departments of Labour/Directories of Manpower & Training and TVETA Punjab.

Course Title	<b>CONSTRUCTION MACHINERY OPERATOR</b>	Course Code	C-132
Entry Level	Middle/Matriculation	Duration of Course:	3 Months
Age Group	15 to 25 Years	Medium of Instruction	Urdu/ English
Training Methodology	Theory: 20% Practical: 80% Total Hours: 360                      5 Hours per day                      6 days a week		
<b>OVERALL OBJECTIVE</b>	After completion of training the trainee should be able to find suitable employment as construction machinery operator under the supervision of skilled operators in the construction industry.		

### **SPECIFIC OBJECTIVES:**

After completion of the course the trainee should be able to:

- Operate the construction machinery skillfully and take necessary safety measures
- Observe traffic rules, regulations and road safety
- Carry out routine maintenance and servicing of construction machinery
- Know the major components of the machinery and their function
- Select the proper tools and materials for the maintenance of construction machinery

### **KNOWLEDGE REQUIREMENTS:**

After completion of the course the trainee should be able to:

- Operate the construction machinery skillfully and take necessary safety measures
- Observe personal hygiene, tidiness, wear protective clothing. Do first aid treatment
- Use fire extinguishers

- Handle tools and equipment
- Know the handling and operation of construction machinery
- Have knowledge of road signs and traffic rules
- Perform routine maintenance and periodic servicing

### **SKILL REQUIREMENTS:**

After the completion of the course the trainees will be able to:

- Operate equipment efficiently with all essential implements by observing necessary precautions and driving rules
- Perform skillfully field operation
- Select and use of workshop tools correctly, properly and carefully
- Able to remove minor faults
- Perform routine maintenance and periodic servicing
- Install and remove implements
- Know the procedure to maintain the battery and electric system
- Know the adjustment for change of V-belt
- Able to maintain the logbook

### **SCHEME OF STUDIES:**

SN	Topics	Theory hours	Practical hours	Total hours
1.	Safety precautions and work ethics	04	06	10
2.	Materials, machine elements , tools and their use	4	04	8
3.	Engine, intake and exhaust system and its maintenance.	06	25	31
4.	Fuel system, cooling & lubrication system and its maintenance	10	33	43
5.	Electrical system and its maintenance	05	10	15
6.	Clutch, transmission system and its maintenance	05	25	30
7.	Driven units wheel and tyre and its maintenance	06	15	21



8.	Steering and break system and its maintenance	10	30	40
9.	Hydraulic system and its maintenance	06	25	31
10.	Construction machinery operation, replacement of implements, common nuts and bolts.	10	25	35
11.	Road signs and driving practice of grader.	06	90	96
<b>Total Hours</b>		<b>72</b>	<b>288</b>	<b>360</b>

### **DETAILS OF TOPICS:**

SN	Topics	Theory hours	Practical hours	Total hours
1.	SAFETY PRECAUTIONS and work ethics			
2.	MATERIALS <ul style="list-style-type: none"> <li>• Common diesel engine lubricants and their properties</li> <li>• Common diesel engine coolant and their properties</li> </ul>			
3.	TYPE OF MACHINE ELEMENTS <ul style="list-style-type: none"> <li>• Bolts, nuts, springs and washers</li> <li>• Gears and shafts</li> <li>• Screw threads</li> <li>• Bearings</li> </ul>			
4.	ENGINE <ul style="list-style-type: none"> <li>• Classification of engines</li> <li>• Basic principle of operation of internal combustion engines.</li> <li>• Principle of operation of two and four stroke engines</li> <li>• Primary requirements of an engine</li> <li>• Difference between gasoline and diesel engine, their advantages and disadvantages</li> </ul>			

	<ul style="list-style-type: none"> <li>• Diesel engine horse power and torque curves</li> <li>• Terminology related to engines</li> <li>• Names, location and function of major systems and components of a diesel engine</li> </ul>			
5.	<b>INTAKE AND EXHAUST SYSTEM</b> <ul style="list-style-type: none"> <li>• Purpose function and service of pre-cleanser, air and dust cleaner</li> <li>• Layout of intake and exhaust systems</li> <li>• Purpose of exhaust silencers</li> <li>• Purpose and working principle of super charger and turbo charger</li> </ul>			
6.	<b>FUEL AND FUEL SYSTEM</b> <ul style="list-style-type: none"> <li>• Characteristics of petrol and safe handling</li> <li>• Characteristics of diesel and light oils</li> <li>• General layout and components of the fuel system</li> <li>• Fuel filters and their use</li> <li>• Various types of fuel injection pumps, their operation Bosch &amp; PT pumps</li> <li>• Fuel feed pump, priming and checking</li> </ul>			
7.	<b>COOLING SYSTEM</b> <ul style="list-style-type: none"> <li>• Layout, purpose and principle of operation of the cooling system</li> <li>• Radiator, thermostat, radiator cap and hoses</li> </ul>			
8.	<b>ELECTRICAL SYSTEM</b> <ul style="list-style-type: none"> <li>• Basic electricity, meaning of AC/ DC theory, Ohms Law</li> <li>• Function of batteries and their basic constructional features.</li> <li>• Layout and operation of electrical system</li> <li>• Maintenance of battery and its charging</li> </ul>			

9.	<b>CLUTCH SYSTEM</b> <ul style="list-style-type: none"> <li>• Operation of different transmission clutches</li> <li>• Types of clutches and their basic principle of operation</li> <li>• Drive clutch paddle to clutch lining</li> </ul>			
10.	<b>PROPELLER SHAFTS AND DRIVE SYSTEMS</b> <ul style="list-style-type: none"> <li>• Purpose and operation of propeller shafts and universal joints</li> <li>• Purpose, construction and operation of differential bevel gear and pinion</li> <li>• Purpose, construction and operation of final drive</li> </ul>			
11.	<b>STEERING SYSTEM</b> <ul style="list-style-type: none"> <li>• Principal of operation of steering system</li> <li>• Layout of steering system in crawler and wheeled construction machinery</li> <li>• Purpose, construction and operation of the steering clutch</li> </ul>			
12.	<b>WHEELS AND TYRES</b> <ul style="list-style-type: none"> <li>• Type of tires</li> <li>• Construction and function of tires</li> <li>• Characteristics of tubeless tire</li> <li>• Maintenance of tires</li> <li>• Tires traction and floatation</li> <li>• Tire pressure and fixing reasons</li> </ul>			



13.	<b>BRAKE SYSTEM</b> <ul style="list-style-type: none"> <li>• The purpose types and brakes</li> <li>• Layout of braking system used in crawler and wheeled type of construction machinery</li> <li>• Importance of hand brake</li> <li>• Importance of brake and disc pads</li> </ul>			
14.	<b>HYDRAULIC SYSTEM</b> <ul style="list-style-type: none"> <li>• Theory, operation and component parts of different braking systems</li> <li>• Introduction of Pascal's Law</li> <li>• Types of pumps and motors used in hydraulic system</li> <li>• Purpose and function of various types of hydraulic actuators</li> <li>• Purpose and function of major types of hydraulic control valves</li> <li>• Types of hydraulic lines and their functions</li> <li>• Advantages and disadvantages of hydraulic and mechanical system</li> </ul>			
15.	<b>CONSTRUCTION MACHINERY OPERATION, REPLACEMENT OF IMPLEMENTS, COMMON NUTS AND BOLTS</b>			
16.	<b>ROAD SIGNS AND DRIVING PRACTICE OF GRADER</b>			

**EQUIPMENT AND TOOLS:**

SN	Equipment /Tool	Quantity
1	Grader (Kumotsu)	1
2	Grader (Catter Pillar)	1

**TEACHING MODELS:**

SN	Models	Quantity
1	Two Stroke (petrol engine)	1
2	Four stroke (Petrol engine)	1
3	Diesel engine model two stroke	1
4	Four stroke (four stroke diesel engine)	1
5	Gear box model	1
6	Mechanical break model	1
7	Hydraulic break model	1
8	Steering model with stand	1
9	Complete main axle model with stand	1
10	Fuel injection pump model	1
11	Teaching chart	15
12	Advisory chart	15



## **EMPLOYABILITY OF GRADUATE TRAINEES:**

After completion of the course the trainees will be able to work as heavy machinery operators under the supervision of experienced heavy machinery operators

1. Work as heavy machinery operator with private construction companies.
2. Govt. Departments.

**Note:** Trainees completing training will require further on-the-job training under the supervision of experienced mechanic or attend further training course.

## **QUALIFICATION OF INSTRUCTOR:**

- Three years diploma from a Polytechnic Institute with three years experience
- Two years certificate with five years experience

## **EXAMINATION AND CERTIFICATION:**

The testing shall be carried out by the respective institutions under the overall supervision of Testing Boards.