ELECTRICIAN

NSQF (LEVEL - 5)

2nd Year (Vol II of II)

TRADE THEORY

SECTOR: Power

Directorate General of Training

DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA

NATIONAL INSTRUCTIONAL MEDIA INSTITUTE, CHENNAI

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Sector : Power

Duration : 2 - Years

Trade : Electrician 2nd Year (Vol II of II) - Trade Theory - NSQF (LEVEL - 5)

Developed & Published by

National Instructional Media Institute
Post Box No.3142
Guindy, Chennai - 600032
INDIA
Email: chennai-nimi@nic.in
Website: www.nimi.gov.in

First Edition :	November 2018	Copies : 1000
First Reprint :	February 2021	Copies : 2000

Rs.260/-

FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising of various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

National Instructional Media Institute (NIMI), Chennai has come up with instructional material to suit the revised curriculum for **Electrician 2nd year (Vol II of II) Trade Theory NSQF (LEVEL - 5)** in **Power** sector under Yearly Pattern required for ITIs and related institutions imparting skill development. The NSQF (LEVEL - 5) will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF (LEVEL - 5) trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF (LEVEL - 5) the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

RAJESH AGGARWAL
Director General / Addl. Secretary,
Ministry of Skill Development & Entrepreneurship,
Government of India.

New Delhi - 110 001

PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Training (D.G.T), Ministry of Labour and Employment, (now under Directorate General of Training (D.G.T), Ministry of Skill Development and Entrepreneurship) (MSDE) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi (NSQF) under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other supporting materials.

The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

R. P. DHINGRA
EXECUTIVE DIRECTOR

Chennai - 600 032

ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisations to bring out this Instructional Material **(Trade Theory)** for the trade of **Electrician NSQF (LEVEL - 5)** under **Power** Sector for ITIs.

MEDIA DEVELOPMENT COMMITTEE MEMBERS

Shri. T. Muthu	-	Principal (Retd.), Govt. ITI (W), Madurai, Tamil Nadu
Shri. C.C. Jose	-	Training Officer (Retd.), ATI, Guindy, Chennai
Shri. K. Lakshmanan	-	Assistant Training Officer (Retd.), Govt. ITI, Ambattur Chennai
Shri. N. Senthilkumar	-	Vocational Instructor, ATI, Guindy Chennai

NIMI CO-ORDINATORS

Shri. K. Srinivasa Rao	-	Joint Director NIMI, Chennai - 32.
Shri. Subhankar Bhowmik	-	Assistant Manager, NIMI, Chennai - 32.

NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

This manual for trade Theory is intended for use in the ITI class room. It consists of a series of lessons that are to be completed by the trainees during the Third semester of course is the **Electrician trade under Power Sector. It is National Skills Qualifications Framework NSQF (LEVEL - 5),** supplemented and supported by instructions/information to assist the trainees in performing the exercises. The syllabus for the 2nd year (Vol II of II) **Electrician NSQF (LEVEL - 5)** Trade under **Power Sector** Trade Practical is divided into Seven modules.The allocation of time for the various modules is given below:

Module 1 - Electronic Practice	15 Exercises	175 Hrs
Module 2 - Control Panel Wiring	5 Exercises	100 Hrs
Module 3 - AC/DC Motor Drives	3 Exercises	50 Hrs
Module 4 - Inverter and UPS	6 Exercises	75 Hrs
Module 5 - Power Generation and Substation	7 Exercises	50 Hrs
Module 6 - Transmission and Distribution	7 Exercises	50 Hrs
Module 7 - Circuit Breakers and Relays	5 Exercises	25 Hrs
Total	48 Exercises	525 Hrs

The syllabus and the content in the modules are interlinked. As the number of workstations available in the electrical section is limited by the machinery and equipment, it is necessary to interpolate the exercises in the modules to form a proper teaching and learning sequence. The sequence of instruction is given in the schedule of instruction which is incorporated in the Instructor's Guide. With 25 practical hours a week of 5 working days 100 hours of practical per month is available.

The procedure for working through the 48 exercises for the 2nd year (Vol II of II) with the specific objectives to be achieved as the learning out comes at the end of each exercise is given in this book.

The symbols used in the diagrams comply with the Bureau of Indian Standards (BIS) specifications.

This manual on trade Theory forms part of the Written Instructional Material (WIM), which includes manual on trade practical and assignment/test.

CONTENTS

ASSESSABLE / LEARNING OUTCOME

On completion of this book you shall be able to

- **Detect the faults and troubleshoot inverter, stabilizer, battery charger emergency light and UPS etc.**
- **Plan, assemble and install solar panel**
- **Erect overhead domestic service line and outline various power plant layout.**
- **Examine the faults and carryout repairing of circuit breakers.**
- **Identify the control and functional switches in C.R.O and measure the DC and AC voltage, frequency time period.**
- **Construct and test a half and fullwave rectifiers with and without filter circuits.**
- **Draw and wire up the control panel for forward/ reverse operation of induction motor.**
- **Control speed and reverse the direction of rotation of different type of three phase induction motor using VVVF control /AC drive**