GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI-25

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**INSTALLATION OF VARIABLE FREQUENCY DRIVES**
Course Code	**EE/2020/015**
Course Duration	60 Hours
Minimum Eligibility Criteria	ITI/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	Training module has been designed for the participants to • Understandthe fundamentals of VFD. • Understandthe parameters involved in Electric Drive • Understand the use of Basic Operating Panel of VFD • Procedure of Installation and Programming of VFD • Troubleshooting procedure of VFD.
Course Outcomes	At the end of training, the trainees will be able to • Perform Installation of VFD. • Perform commissioning and testing of VFD • Operate and set parameter through Basic Operating Panel (BoP) • Troubleshoot fault in Electric Drive
Expected Job Roles	VFD Installer

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EE/2020/015	INSTALLATION OF VARIABLE FREQUENCY DRIVES	Theory	24	10	20	3 Hours
		Practical	36	40	80	
		Total	60	50	100	

EE/2020/015- INSTALLATION OF VARIABLE FREQUENCY DRIVES

DETAILED SYLLABUS

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	**Electrical & Motion Fundamentals:**	**10 Hours**	
1.1	Torque, Speed & Horsepower	06	04
1.2	Common Types of Mechanical Loads		
1.3	Characteristics of Variable Torque and Constant Torque Loads		
1.4	Magnetic Poles and Frequency as Related to Motor Speed		
1.5	Torque Characteristics Motors Operated “Across-the-Line”		
II	**Variable Frequency Drive Fundamentals:**	**15 Hours**	
2.1	Introduction to VFD	08	07
2.2	Why a VFD – Applications of VFD		
2.3	Construction of VFD		
2.4	Pulse Width Modulation		
2.5	Carrier Frequency		
2.6	Fundamentals Frequency		
2.7	Control Modes for Speed & Torque		
2.8	Voltage and Frequency Relationships and Effects on Motor Performance		
2.9	Option in VFD (Bypass, Fusing, Motor Overload Device) Benefits of VFD		
III	**Drive Programming & Installation:**	**20 Hours**	
3.1	**Practical:** Installation of a VFD	05	15
3.2	Customer connections (Safety Circuit, Start/Stop, Jog, Status Indication, Fault Identification, Remote Speed reference, Monitoring of Motor Parameters)		
3.3	Power Circuit Wiring & Grounding		
3.4	Parameter & Programming		
3.5	Menu Navigation & LCD Display		
3.6	Common Parameters		
3.7	Braking Methods		
3.8	start up and commissioning		
IV	**Troubleshooting Drive Problems:**	**15 Hours**	
4.1	Basic Troubleshooting	05	10
4.2	Internal Tests & Checks		
4.3	VFD Trouble shooting checklist - Using VFD with PLCs		
	Total Theory and Practical Hours	**24**	**36**
	Total hours	**60**	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	Electrical Tools Set
2	Variable Frequency Drive
3	PC/Laptop
4	Multimeter
5	Clamp Meter

SOFTWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	VFD Commissioning Software

REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	VFD Challenges for Shipboard Electrical Power System Design	Mohammed M. Islam	John Wiley & Sons.
2	Variable Speed Pumping: A Guide to Successful Applications	Europump& the Hydraulic Insti	Elsevier.
3	Implementation of Variable Frequency Drives (VFD)	Tehseen Ahmad	GRIN Verlag.
4	Electrician's Technical Reference: Variable Frequency Drives	Robert S. Carrow	Cengage Learning

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 CIICP 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 CIICP 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)Objective and Circuit Diagram	20
	b)Procedure and Connections / Execution	20
	c)Result and Viva	20
	d) Record	20
	Total Marks	**100**

MODEL QUESTION PAPER

EE/2020/015- VARIABLE FREQUENCY DRIVES

(Maximum Marks: 20)

(N.B: Answer Any Twenty Questions) (20 X 1 = 20 Marks)

1. What are the common types of mechanical loads?
2. How the synchronous speed of electric motor is determined?
3. Why VFD used in industries?
4. What is the advantage of PWM based VFD?
5. Which component mainly used in VFD to design inverter?
6. What are the control methods used in AC Inverter drives?
7. What are the effect of voltage and frequency relationship in induction motor?
8. What is Bypass in VFD?
9. What are the benefits of fusing in VFD?
10. Are The Variable Frequency Drives Phase Sensitive?
11. Will A Variable Frequency Drive or Variable Speed Drive Save Me Money?
12. Does A Motor Need a Chassis Ground Connection?
13. What Are Some of the Common Reasons Why Motors Fail?
14. What is the Preferred Communication Method used in VFD?
15. What is the Control Voltage VFD?
16. In What Environment is the Drive Located?
17. What is the Motor's Full Load Amp Rating?
18. What is the system voltage VFD?
19. What is the Application of VFD?
20. What are the major blocks of VFD?
21. What's the difference between a variable frequency drive (VFD) and a variable speed drive (VSD)?
22. What is the weakest link in VFD components?
23. What are the key considerations for single to three phase conversion using VFDs?
24. What is a line reactor and what will it do for my application?
25. What filters are used for the VFD?