



# MAINTENANCE AND TROUBLESHOOTING OF ELECTRICAL SUPPLY CIRCUITS, RELAYS, CONTACTORS AND MOTORS

**1** December 4-5, 2023 (Monday-Tuesday)  
**8.45am – 5.00pm** FMM Institute, Perak

The "Maintenance & Trouble-shooting of Electrical Supply Circuits, Relays, Contactors and Motors course provides a fundamental understanding of how to maintain and trouble shoot Electrical Circuits. Participants will understand on the proper Equipment to use for checking electrical circuit. Participants will also understand on how to perform Electrical Test before putting equipment to service. The goal of this course is to ensure participants understand how to "Trouble shoot Electrical Circuits", reduce equipment downtime, improve efficiency and safety at workplace.



## .... COURSE CONTENTS....

### MODULE 1 – INTRODUCTION OF ELECTRICAL SYSTEMS

- Understand the Electrical System in Theory.
- What is Electricity
- Transmission, Generation and Distribution.
- Broaden knowledge on In-House Power Distribution Systems.
- Ability to differentiate the different Voltages in a Manufacturing Plant.
- Practical viewing and explanation of Main Switch Board in FMM Building.
- Types of Current
  - ⇒ AC
  - ⇒ DC

### MODULE 2 – OHM'S LAW, POWER FORMULA AND CALCULATIONS

- Voltage, Resistance, Current
- Resistance in Series
- Resistance in Parallel
- Power – kW, HP, kVA
- How to size up an equipment
- Ability to size up cables and Breakers for an Installation.

### MODULE 3 – CIRCUIT DESIGN

- Single Phase

## .... OBJECTIVES....

- Understand the Electrical System in an Industry.
- Reduce and eventually eliminate the risk of Electrical related accidents.
- Maintenance and Troubleshooting of Electrical Supply Circuits, Relays, Contactors and Motors.
- Understand Single Phase and Three Phase Systems and the corresponding Voltages.
- Ability to differentiate the different Voltages in a Manufacturing Plant.
- Able to size up Breakers for Equipment.
- Understand the various Tests to be conducted before Equipment is put into service.
- Understand the various Control Circuits and Starters.

- Three Phase
- Industrial, Commercial and Residential distribution systems.
- Star and Delta Connection.
- Electrical Test Equipment
  - ⇒ AVO Meter
  - ⇒ Insulation Megger
  - ⇒ Earth Megger
  - ⇒ Clamp Meter
  - ⇒ How to use Electrical Test equipment

### MODULE 4 – MOTOR CONTROLS

- Understanding Electrical Symbols and Terminology
- Types of Motors
- Types of Starters
- Single Line Control Circuit
- Trouble Shooting and Rectifying
- Magnetic Contactors
- Relays
- Timers
- Over Current Relays
- Push Button Switches
- Trouble shooting of Motors and its Symptoms

### MODULE 5 – TYPES OF ELECTRICAL FAILURES

- Open Circuit
- Short Circuit
- Earth Fault
- Causes of Electrical failures
  - ⇒ Danger to humans.
  - ⇒ Loss of equipment.
  - ⇒ Electrical fires
- Fault Limiting Devices
  - ⇒ Fuses
  - ⇒ Circuit Breakers
  - ⇒ RCCB

### MODULE 6 – TEST TO BE PERFORMED

- Understand the various Tests to be performed before an equipment is put into service.
- Insulation Resistance Test.
- Earth Resistance Test.
- Continuity Test.
- Polarity Test.

### MODULE 7 – ELECTRICITY SAFETY

- Basic understanding on Electrical Safe Practice and LOTO.
- Understand the hazards of Electricity.
- PPE – Use proper PPE
- Good Electrical practices.

## .... LEARNING OUTCOMES....

Upon completion of this course, participants will be able to:

- Understand the various Starters to be utilized for different Motors.
- Understand the Theories of Generation, Transmission & Distribution.
- Calculate Voltage, Current & Power.
- Basic Electrical Theories.
- Types and Size of Cables and Current carrying capacity.
- Faults and How to solve the problems.
- Simple Trouble Shooting Techniques.

.... **TRAINER....**

**MR BALASUBRAMANIAM A/L SANYASI** is an experienced Instructor with more than 30 years' experience in the Industry. He has been working in the Electrical, Facilities & Maintenance field for more than 30 years and has vast knowledge in this area. He holds an Executive Diploma in Facilities and Building Maintenance Management from Universiti Teknologi Malaysia, an Executive Masters in Facilities & Building Maintenance Management from Open University Malaysia and a Diploma in Electrical Engineering from Butterworth Institute of Technology. Mr Balasubramaniam who is a competent Chargeman, is currently holding "Penjaga Jentera Voltan Tinggi" Sekatan BO 33kV, a registered Asean Engineering Technologist, a Certified Technician in Electrical & Electronics Technology with Malaysia Board of Technologist and also a Qualified Technician in Building & Construction Technology registered with Malaysia Board of Technologist. He is a registered trainer with PSMB.

**MR BALASUBRAMANIAM** had been a Chargeman AO Trainer since 2000 and a Technical Trainer since 2008 having conducted numerous trainings such as Trouble Shooting Skills, Electrical Maintenance, Preventive Maintenance, Facilities Systems. He is also conducting "Executive Diploma in Facilities & Building Maintenance Management" for University Teknologi Malaysia. He is the Secretary of Technological Association of Malaysia, Penang Branch. He has worked with various Multinationals in Managerial positions, namely Hitachi Metals Electronics Perai, Advanced Disk Technology/Hoya Electronics Kulim, Johnson Controls Malaysia Sdn. Bhd, Boral Plasterboard (Lafarge) Malaysia Sdn. Bhd, Sony Electronics Perai. Currently he is the Facilities Senior Engineer in a multinational company.

.... **WHO SHOULD ATTEND....**

Electricians, Technicians or Maintenance Personnel involved in the operation and maintenance of machine or system that use electrical motors.

.... **COURSE DETAILS....**

Date **December 4-5, 2023 (Monday-Tuesday)**  
Time **8.45am – 5.00pm**  
Venue **FMM Institute Perak**  
**No 1, Lorong Raja DiHilir, 30350 Ipoh, Perak**  
Medium of Instruction **English**  
CPD **14 hours**  
Fees  **Members RM848.00/pax**  **Non-Members RM1,007.00/pax**  
*(Fees inclusive of Service Tax at 6%, Course Materials, Refreshment, Lunch and Certificate of Attendance)*

.... **ADMINISTRATIVE DETAILS....**

**HRD CORP CLAIMABLE COURSE DETAILS**

- Training Provider: **FMM Institute Perak** ■ MyCoID : **475427W\_PERAK**
- HRD Corp Programme No: **Provided upon confirmation**

**DISCLAIMER**

The FMM Institute reserves the right to change the facilitator, date and to vary / cancel the course should unavoidable circumstances arise. All efforts will be taken to inform participants of the changes.

**REGISTRATION**

- Upon **Faxing/Mailing** the completed **Registration Form** to FMM Institute, you are **deemed** to have read and **accepted** the terms and conditions. The **course** would also be **deemed** as **confirmed** unless informed otherwise.
- Will be based on First-Come-First served basis.

**PAYMENT**

- **Cheques** made in favour of "**FMM Institute**" should be forwarded to FMM Institute Perak.
- For **HRD Corp Claimable Course**, an **Attendance of 100% is a must**, in any case, **employers will be billed in full**.
- FMM Institute SST Registration No. **W10-1901-32000105**

**CANCELLATION**

Must be in Writing with Reasons ■ 7 days before the course – No payment charged ■ 3 – 6 days before the course - 50% payment charged ■ < 3 days before the course – Full payment charged ■ Participants who did not turn-up will be charged full payment ■ Replacements can be accepted at no additional cost.

~ **Registration Form** ~

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**Closing Date:**  
**NOVEMBER 27, 2023**

FMM Institute  
No 1, Lorong Raja DiHilir, 30350 Ipoh, Perak

Fax: 05-5488221

Dear Sir / Madam, please register the following participant(s) for the above programme.

1.	Name		Designation	
			HP No	
	NRIC		Email	
2.	Name		Designation	
			HP No	
	NRIC		Email	
3.	Name		Designation	
			HP No	
	NRIC		Email	

*(Please attach a separate list if space is insufficient)*

We hereby confirmed that *(Please tick (✓) in appropriate box):-*

- We **will be claiming from HRD Corp** and full payment would made to FMM Institute in the event that no disbursement from HRD Corp under any circumstances
- We will **NOT BE CLAIMING from HRD Corp**. Enclosed cheque/bank draft No \_\_\_\_\_ for RM \_\_\_\_\_ being payment for \_\_\_\_\_ participant(s) made in favour of the "**FMM Institute**".

Submitted by:

Name:	Designation:	
Company:	Tel:	Fax:
Address:		
Email:	FMM Membership No	