Boat & Yacht Electrical Level 1

Pre-course requirements: Boat & yacht Level 1

- **Battery Rating Methods**
  - Battery Standards
  - Ah Rates in detail
  - C Rates
  - CCA Rates
  - RC Rates
  - Testing Batteries
  - Bank Sizing
- **Battery Technology, Safety & Care**
  - Flooded Lead Acid
  - Gel
  - Valve Regulated Lead Acid
  - Cycling
  - Round trip efficiency
  - Lithium Batteries
  - Safety all batteries
  - Battery preservation
- **Battery Charging**
  - Single Stage Charging
  - Multistage charging
    - Bulk
    - Absorption
    - Float
  - Voltage & Current during charging.
  - C-Rates & Charging
  - Limitations of Alternator charging
- **DC Circuit protection**
  - Discrimination
  - Sizing
  - Placement
  - Trip characteristics
  - Ratings
- **Alternators - External regulation**
  - Internal Regulation v External
  - Single stage v Multi stage
  - Voltage & current relationship
- **Multiple Alternators**
  - 2 Alternators on 1 engine
    - Centre fielding
  - Multi Engine / battery methods
  - Connecting multiple alternators
  - Built in redundancy methods
    - Combiners
    - Splitters
- **Solar Power**
  - Introduction to solar
  - Solar panel safety
  - Solar Panel Specifications explained
    - ISC
    - VOC
    - Impp
    - Vmpp
    - Pmpp
  - Solar Panel recognised standards explained
    - STC
    - PVUSA
  - Panel Technology explained
    - Mono Crystalline
    - Poly Crystalline
  - Panel Wiring
    - Parallel
    - Series
  - Controller technology explained
    - Pulse Width Modulation
    - MPPT
  - Placement of panels
    - Shadowing
  - Interfacing - DC power Bus
  - Interfacing - Data Bus
- **Wind Turbines**
  - Types
  - How they work
  - 3 phase alternator
  - Phase current measurement
  - Controllers
  - Interfacing - power bus
  - Interfacing - data bus
- **AC Shore power**
  - Introduction to Alternating Current
    - How AC is produced
    - The 3 Phase systems
    - Phase to phase voltages
    - Single phase voltages
    - Dangers of incorrect wiring
    - The single phase conductors
    - The 3 Phase Conductors
  - Reverse polarity
    - Reverse polarity Dangers
    - Detection of reverse polarity
    - Correction of reverse polarity
  - Earthing
    - Reason for earthing
    - Dangers of faulty earths
    - How to identify faulty earth connection
- **AC Circuit protection**
  - Earth Leakage
  - Electric Shock Drowning
    - Causes
    - Methods of 100% prevention
  - The RCCB
    - How it works
    - Limitations
  - Overcurrent
  - The MCB
- **Inverters**
  - Safety
  - Sizing
  - Voltage drop calculations
  - Testing
    - Ripple test
    - Over current test
    - Voltage drop test
  - Earthing requirements
  - Circuit protection DC
  - Circuit protection AC
- **Generators**
  - Safety
    - Carbon Monoxide poisoning
    - Fire
    - Electrocution
    - Flooding
  - Types
    - Synchronous
    - Inverter
  - Pre start checks
  - Starting the generator
  - Loading the generator
  - Power factors
  - Inrush currents
  - Balancing loads
- **Galvanic action**
  - Science
    - Electron Flow
    - Conventional flow
    - Ion Flow
    - Galvanic Scale
  - The Sacrificial Anode
  - Inter-boat galvanic action
  - The Galvanic Isolator
- **Isolation Transformers**
  - Safety
  - Purpose
  - How they work
  - Electromagnetic induction process
  - Losses
    - Copper losses
    - Eddie currents
    - Efficiency
  - Earthing arrangements
  - Dangers of use on dry dock
- **Electrolytic corrosion**
  - Nature of electrolytic corrosion
  - Ferocity
  - Causes of Electrolytic corrosion.
  - Prevention of Electrolytic corrosion
- **Refrigeration**
  - The refrigeration process
    - Adiabatic process
    - Compressor function
    - Condenser coil function
    - Evaporator coil function
  - Common causes of faults
    - Voltage drop
    - Gas loss
    - Corrosion of terminals
    - Faulty Condenser coil fan
  - Diagnosis, fault finding
    - Voltage drop test
    - Current clamp test
    - Fitting a diagnostic lamp
    - Reading fault codes
  - Increasing /Decreasing the cooling capacity
    - Raising compressor speed
    - Raising the current draw
    - Reducing compressor speed
    - Reducing the current draw
- **Water Makers**
  - How they work
  - Safety
  - Fault finding, testing
    - Voltage drop test
    - Poor connection checks
    - Faulty Capacitors (AC systems)
    - Current clamp test
  - Modern technology versus old
  - Energy recuperation
- **VHF Radio**
  - Connections
    - Power
    - NMEA Data
    - Coax Cabling
  - The antenna
    - Forward power
    - Reflected power
    - Standing waves
    - Voltage Standing Wave Reflections
    - VSWR Testing
- Course completion with *optional written Exam. (If you are under sponsorship, or apprenticeship the written exam is mandatory)

This course is NOT a marine electricians course. It is designed for boat owners, skippers and crew of vessels who do not require mandatory IMO electrical training but who wish to improve and certify their onboard electrical skills and knowledge.