

# ECET 222 Marine Engineering Technology

Hours: 3/0/0

Corequisites: ECET 247

## Short Description:

Students will build on their knowledge of electrical systems and examine these systems as they relate to the marine environment. Topics related to marine engineering including generation, distribution and protection, steering and propulsion systems will be studied. Through research and discussion, students will examine the marine environment and its effects on electrical system design.

## Course Overview

(1HR)

### Shipboard Power System Architectures

(3HRS)

- Design Overview
- Types of ship drives
- Electrical Load Analysis
- Power System Configurations
- Reliability and Efficiency

### Power Equipment Design Considerations

(2HRS)

- Power Losses
- Maximum Efficiency
- Voltage Regulation
- Load Sharing
- Power Ratings

### Power Cables

(2HRS)

- Construction
- Gage
- Insulation
- Ampacity
- Modelling
- Skin and Proximity Effects
- Cable Design
- Specialty Marine Cables
- Routing and Installation

## **Power Distribution**

(2HRS)

- Overview
- Grounded vs Ungrounded Systems
- Ground Fault Detection Schemes
- Feeder Voltage Drops
- Bus Bars
- High Frequency Distribution
- Switchboard and Switchgear

## **Fault Current Analysis**

(4.5HRS)

- Types and Frequency
- Fault Analysis Model
- Asymmetrical Fault Transient
- Fault Current Offset Factor
- Fault Current Magnitudes
  - Symmetrical
  - Asymmetrical
  - Transient vs Subtransient Reactance
  - Generator, Transformer and Motor Fault Currents
  - Current Limiting Series Reactor
  - Unsymmetrical Faults
  - Circuit Breaker Selection

## **System Protection**

(7.5HRS)

- Overview
- Fuses
- Overload Protection
- Electromechanical Relay
- Circuit Breaker
- Differential Protection
- GFI's
- Transformer Protection
- Motor Branch Circuit Protection
- Lightning and Switching Protection
- Surge Protection
- Protection Coordination
- Health Monitoring
- Arc Flash Analysis

**Power Economics**

(5HRS)

- Intro
- Economic Analysis
- Power Loss Capitalization
- High Efficiency Motors
- PF Improvement
- PF and Capacitance
- PF vs Efficiency
- Energy Storage
- Efficiency of Motor Speed Drives

**Energy Storage**

(3.5HRS)

- Overview
- Rechargeables
- Performance Characteristics
- Battery Life
- Lead Acid Characteristics
- Battery Design Process
- Safety and Environment

**Marine Industry Standards**

(3HRS)

- Overview
- IEEE-45
- Federal Regulations
- Military-STD-1399

**Evaluation:**

Assignments	20%
Term Tests	30%
Final Exam	50%

**Text:**

Optional: Shipboard Electrical Power Systems by Mukund R. Patel – CRC Press