

Marine Electrical Systems

Part B

Course Outline

| Subject Area | Hours | |
|---|------------|------------|
| | Lecture | Laboratory |
| 0 Orientation | 1.0 | 0.0 |
| 0.1 Introduction to the School | | |
| 0.2 Introduction to the Course | | |
| 0.3 Lab Station Assignments | | |
| 1 Physics and Chemistry Basics | 3.0 | 0.0 |
| 1.1 Matter, Energy, Work, Power, Charge | | |
| 1.2 Electric Potential | | |
| 1.3 Electric Current | | |
| 1.4 Electric Power | | |
| 2 Circuit Elements | 3.0 | 0.0 |
| 2.1 Resistance | | |
| 2.2 Capacitance | | |
| 2.3 Inductance | | |
| 2.4 Voltage Sources | | |
| 2.5 Current Sources | | |
| 2.6 Other Linear and Nonlinear Components | | |
| 3 Chemical Safety | 3.0 | 0.0 |
| 3.1 Hazards | | |
| 3.2 PPE | | |
| 3.3 Safety Precautions | | |
| 4 Electrochemical Systems | 8.0 | 4.0 |
| 4.1 Primary and Secondary Batteries | | |
| 4.2 Fuel Cells | | |
| 4.3 Corrosion | | |
| 4.4 Cathodic Protection Techniques | | |
| 5 Electrical Soldering | 2.0 | 2.0 |
| 5.1 Basic Metallurgy | | |
| 5.2 Soldering Principles | | |
| 5.3 Soldering Equipment | | |
| 5.4 Practical Application | | |
| 6 Electrical Circuits | 3.0 | 1.0 |
| 6.1 Quantities/Relationships | | |
| 6.2 Laws | | |
| 6.3 Practical Circuit Analysis | | |
| 6.4 Marine Examples | | |

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| 7 | Magnetic Circuits | 6.0 | 1.0 |
| | 7.1 Magnetic Phenomena | | |
| | 7.2 Quantities/Relationships | | |
| | 7.3 Laws | | |
| | 7.4 Electrical Analogy | | |
| | 7.5 Examples | | |
| 8 | Electrical Measuring Instruments | 2.0 | 2.0 |
| | 8.1 Digital Multimeter | | |
| | 8.2 Megohmmeter | | |
| | 8.3 4-Wire Kelvin | | |
| | 8.4 Power- Reactive, PF | | |
| 9 | Electrical Safety- 1 KV and Below | 3.0 | 1.0 |
| | 9.1 Hazards | | |
| | 9.2 PPE | | |
| | 9.3 V-Rated Tools | | |
| | 9.4 Precautions | | |
| | 9.4 OSHA-1910, NFPA-70E | | |
| 10 | Sound Powered Telephones | 3.0 | 3.0 |
| | 10.1 Principles | | |
| | 10.2 Circuit Layout | | |
| | 10.3 Accessory Components | | |
| | 10.4 Common Faults | | |
| 11 | Power Systems and Components | 6.0 | 1.0 |
| | 11.1 AC Generation | | |
| | 11.2 Power Cables and Terminations | | |
| | 11.3 3-Phase Systems | | |
| | 11.3 Transformers | | |
| | 11.4 Switchboards; Metering, and Relaying | | |
| | 11.5 Bonding and Grounding Standards | | |
| | 11.6 Ground Fault Detectors | | |
| | 11.7 Cable Sizing- Ampacity, Insulation | | |
| 12 | Industrial Lighting | 4.0 | 2.0 |
| | 12.1 Lighting Design Basics | | |
| | 12.2 Incandescent, Halogen | | |
| | 12.3 Fluorescent | | |
| | 12.4 HID | | |
| | 12.5 LED | | |
| 13 | AC Motors | 3.0 | 3.0 |
| | 13.1 Design and Operation | | |
| | 13.2 Types- Induction, Synchronous | | |
| | 13.3 Starting Characteristics | | |
| | 13.4 Speed, Torque Characteristics | | |
| | 13.4 Failure Modes | | |
| | 13.5 Maintenance | | |

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| 14 Electrical Control Components | 3.0 | 3.0 |
| 14.1 Contactors | | |
| 14.2 Control Relays | | |
| 14.3 Timing, Latching | | |
| 14.4 Sensors | | |
| 14.5 Actuators-Linear, Rotary | | |
| 15 Motor Controllers and Starters | 4.0 | 9.0 |
| 15.1 Across the Line Starter | | |
| 15.2 Reduced Voltage Starters | | |
| 15.3 Soft Starters- Thyristor Based | | |
| 15.4 Circuit Examples | | |
| 15.5 Troubleshooting Techniques | | |
| 15.6 VFD Overview | | |
| 16 Fault Protection/Coordination in Power Systems | 6.0 | 0.0 |
| 16.1 Fuses | | |
| 16.2 Circuit Breakers | | |
| 16.3 Protective Relaying | | |
| 16.4 Differential Current protection | | |
| 17 Single Phase Motors | 4.0 | 2.0 |
| 17.1 Types | | |
| 17.2 Operation | | |
| 17.3 Troubleshooting | | |
| 18 Navigation Lighting | 3.0 | 1.0 |
| 18.1 International Regulations | | |
| 18.2 Circuit Examples | | |
| 19 P.A. Systems | 3.0 | 0.0 |
| 19.1 Acoustic Basics | | |
| 19.2 Electrical Transmission Standards | | |
| 19.3 Fog- Gong Signals | | |
| 20 Automatic Telephone Systems | 3.0 | 0.0 |
| 20.1 Design and Function | | |
| 20.2 Line Installation | | |
| 21 Infrared Measurement Theory | 3.0 | 0.0 |
| 21.1 Classic EM Theory | | |
| 21.2 Applications and Technologies | | |
| 22 Marine Clock Systems | 3.0 | 0.0 |
| 22.1 Design and Layout | | |
| 22.2 Testing | | |
| Final Examination | 3.0 | 0.0 |
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| SUBTOTALS | 85 | 35 |
| TOTAL HOURS | | 120 |