



## MARINE SYSTEMS CERTIFICATE PROGRAM

### OVERVIEW

Developed in response to the marine industry's demand for skilled labor in the growing and rapidly changing field of marine systems, the International Yacht Restoration School has partnered with the American Boat and Yacht Council (ABYC) to develop a full-time, ten-month certificate program in Marine Systems. Based on ABYC standards, the Marine Systems program is designed to teach students how to install, troubleshoot, maintain and repair the major systems found in power and sail boats. The program is taught by industry professionals with considerable experience and certification in the field. Upon completion of the program, students will be prepared to sit for the relevant ABYC certification exams.

**Dates: September through June**

### FIRST TERM (15 WEEKS) - Fall

**SHOP SAFETY AND TOOL USE** The course covers shop safety standards and safe operating procedures for stationary and portable hand and power tools as well as appropriate Federal and State standards, personal protective equipment, machine tool safety, hazardous waste, and fire prevention procedures.

**FRP COMPOSITES FOR THE MARINE TECHNICIAN** This course teaches the knowledge necessary to select proper materials and to observe precautions when working around composite structures, including resin characteristics used in laminates, secondary bonding when modifying an existing structure, and proper core sealing techniques.

**ELECTRICAL FUNDAMENTALS AND BASIC INSTALLATION** This course teaches fundamental principles for circuit and electrical equipment design including use of electrical meters and test equipment to troubleshoot common electrical circuit problems, and component fault identification.

**ADVANCED ELECTRICAL INSTALLATION AND TROUBLESHOOTING** An extension of Electrical Fundamentals and Basic Installation, this course covers circuit layout and design, equipment installations in accordance with the US Code of Federal Regulations (CFR), and more advanced topics covered in the applicable ABYC Electrical Standards.

**ELECTRICAL PRACTICUM** This course is designed to advance installation skills, knowledge and techniques for onboard AC and DC circuitry systems through project exercises.

**PIPING AND PLUMBING / POTABLE WATER SYSTEMS** This course teaches the installation techniques of various onboard plumbing systems, including standard maintenance, winterizing and re-commissioning, seacocks, thru-hull installation and connections, hose and fitting types, drain plugs, and potable water systems.

**ON BOARD TANKAGE (FUEL, POTABLE WATER, WASTE)** This course covers the standards and industry practices that apply to tankage systems, design and installation requirements.

**MARINE SANITATION DEVICES (MSD)** This course covers the Federal and local regulations for waste water systems and specific characteristics of the three general types of sanitation systems. Course work includes commissioning and decommissioning, maintenance, troubleshooting, diagnostics and repair.

**MARINE PUMPS** This course covers the primary pump types and categories including

### MARINE SYSTEMS PROGRAM TOOL LIST

Each student at IYRS is responsible for his or her own set of hand tools. The following tools are required. Tools do not have to be new, simply in good working condition. IYRS instructors are available for advice and direction by contacting the school office.

- Personal Protection Apparatus: Safety Glasses or Goggles, Hearing Protection, Dust Masks
- 263 pc Tool Set Metric & Standard wrenches, Sockets, Deep & Reg., Assorted Tools
- 3" Pipe Wrench
- Small Pipe Wrench
- 6" Adjustable Wrench
- 10" Adjustable Wrench
- 7" Vise Grips
- 18v Cordless Drill
- Channel Locks (2sizes)
- Pliers (reg.)
- Needle Nose Pliers
- Screwdriver Set
- Hacksaw and Selection of Blades
- 5-75 Ft. Lb. Torque Wrench
- 6-drawer Bench Top Tool Chest
- Tool Bag
- Multi – Meter – BK Precision Model 2707A
- Test Lead Set
- Solder Sucker
- Solder Iron 25 – 35 Watt
- Solder Iron Holder
- Solder Gun 150 – 300 Watt
- "Kronos Helping Hands" Tool
- Crimper (Ratcheting Type)
- Forceps
- Side Cutters
- Strippers
- 13 Piece High Speed Twist Drill Set
- Jeweler's Screwdriver Set
- Assorted High Speed Spade Drill Bits (1/2" – 1 1/2")
- Assorted Hole Saw Bits (5/8" – 1")
- Countersink and Power Rasp Bits
- Assorted Drill Driver Bits (Phillips, Flat, Square)
- Razor Utility Knife
- 10" Rasp
- 10" Half Round Course File
- Dial Calipers

This kit is considered to be a basic set. Students will also work with and learn about many other tools commonly used in the trade. When purchasing tools, always keep receipts for return and/or warranty purposes.



## MARINE SYSTEMS CERTIFICATE PROGRAM

impeller, centrifugal, displacement, and diaphragm. Course work includes determining the most appropriate pump type for a given application, pump performance and effective service life, design and installation of various pump systems, and manufacturer specific recommendations.

**LPG AND CNG SYSTEMS** This course covers the installation and service of on board gas systems used for cooking, water heating and cabin heat as well as fuel storage, system design and appliance selection.

**FIRE PROTECTION SYSTEMS** This course covers USCG requirements for onboard fire extinguishing equipment for recreational boats. Course work covers portable, fixed, manually actuated, and automatic systems, fire classifications, differences in extinguishing agents, manufacturer specific recommendations, and system capacity calculations and design.

**FUEL SYSTEMS - GAS & DIESEL** This course covers the design, installation and maintenance procedures for fuel systems as dictated by both the CFR and ABYC Standards. The course outlines the requirements for tank design, location and installation as well as proper plumbing for fuel fill and vent systems.

**STEERING SYSTEMS** This course covers a variety of steering system types for both power and sailing craft. Course work covers selection, installation, and service of marine steering systems, both mechanical and hydraulic. Since many of the systems are proprietary in design, lessons will follow specific recommendations from vendors such as Edson, Teleflex and Vetus.

### SECOND TERM (20 WEEKS) - Spring

**DIESEL ENGINES 1** This course teaches the fundamental principles and operational needs of marine diesel engines. Course work includes the primary needs of a diesel engine; routine maintenance tasks such as commissioning and decommissioning; fuel and lubrication system service, cooling system maintenance and service, and troubleshooting and preliminary diagnostics.

**DIESEL ENGINES 2** This course covers mechanical and electronic diesel engine fuel injection systems and engine drive systems. Course topics include service and diagnostics of fuel injection systems; problems associated with diesel engine performance; theory of operation and design features of engine drive gears, maintenance and service of mechanical and hydraulic inboard engine drive gears, and problem diagnostics for marine gear units. Lab work will cover assembly and disassembly procedures on marine gear assemblies.

**GASOLINE ENGINE MAINTENANCE, REPAIR AND OVERHAUL** This course covers the theory and operation of gasoline inboard and inboard / outboard engines. Course topics include maintenance and repair procedures, commissioning and decommissioning, basic engine needs such as fuel, air, compression and exhaust for both carbureted and fuel injected engines, routine tuning procedures, and use of electronic scanning equipment and proprietary laptop-based software programs to perform diagnostic procedures on new engine EFI systems.

**INBOARD/OUTBOARD AND SAILDRIVE MAINTENANCE, REPAIR AND OVERHAUL** This course covers removal and installation techniques, routine maintenance, disassembly and overhaul of inboard/outboard and saildrive gear assemblies from Yanmar, Mercury and Volvo Penta.

**MECHANICAL PRACTICUM** This course is designed to advance installation skills, knowledge and techniques for onboard mechanical drive diesel and gasoline power systems through project exercises.

**AIR CONDITIONING AND REFRIGERATION SYSTEMS** This course covers the basic physics of refrigeration systems, principles of operation, cooling components, essential selection, sizing and systems maintenance methods and procedures, and environmental considerations. Lab work includes system problem diagnosis, refrigerant recovery, system evacuation and recharge procedures and leak detection.

**PROJECT MANAGEMENT** This course covers the basic principles and skills of estimation, costing, budgeting and contracting for electrical systems and power systems installations.

**MARINE ELECTRONICS INSTALLATION AND TROUBLESHOOTING** This course covers the types and categories of equipment used in onboard electronic systems including communications and navigation equipment, autopilot, and networked monitoring systems. Course work includes installation, ergonomics, weatherproofing, grounding and antenna mountings, FCC requirements, and NMEA (National Marine Electronics Association) installation standards.

**ELECTRONICS PRACTICUM** This course is designed to advance installation skills, knowledge and techniques for onboard marine electronic systems through project exercises and hands-on use.

**INDUSTRY EXTERNSHIP** This course is designed to advance the skills and proficiencies taught in the program and to promote self-motivation and confidence in an economically driven real world environment through self-elected industry externships.