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Introduction of the marine engineering curriculum to the Naval Technical School of Honduras

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WORLD MARITIME UNIVERSITY

INTRODUCTION OF THE MARINE ENGINEERING CURRICULUM TO THE NAVAL TECHNICAL SCHOOL OF HONDURAS

BY

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HONDURAS

A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of Master of Science in Maritime Education and Training (Marine Engineering).

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I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has been previously conferred upon me.

The contents of this dissertation reflect my personal views and are not necessarily endorsed by the University.

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To my wife MIMI and my daughter
MARTA RAQUEL,
the only reason for my existence

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Finally, to my country Honduras, which under its flag, I have once again had the opportunity to go abroad to acquire valuable knowledge and experience that hopefully in the near future could be put to use for it's economic and social development, and that of it's people.

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INTRODUCTION

Honduras is a country with large maritime economic interests. It has been practicing the open registry system since 1920. Honduras has, at the present, approximately twenty thousand seafarers around the world. It has a large and rich Economic Exclusive Zone and maritime boundaries with nine countries. Almost ten percent of the Gross Domestic Product comes from the sea resources; and almost all of the commerce of the country comes from shipping.

Because of the reasons above I consider it important to establish the country as a maritime nation. In order for this concept to apply to the overall situation of the country, it is important to incorporate maritime education into the existing system and in this way to exploit this condition with respect to the sea.

As the first step and contribution for the establishment and future development of the maritime education in Honduras, I propose through this paper to modify the academic curricula of the Technical School of the Honduran Navy in order to accomplish the mentioned goal. This proposal is approached through this paper by the following manner:

a. Chapter I:

This chapter establishes Honduras as a maritime nation, and emphasizes the importance of taking the necessary steps to reach a general consensus among the population in recognizing this condition, and to further take advantage of it.

b. Chapter II:

This chapter makes an analysis of the STCW Convention, with special emphasis on the engineering aspects of it.

c. Chapter III:

This chapter contains the present academic curricula of Mechanics and Electrotechnology of the Naval Technical School.

d. Chapter IV:

This chapter contains the proposed academic curricula of the School, with it's application to Marine Engineering.

e. Chapter V:

This chapter contains the pathline for certification the Technical School graduate has to follow if he has chosen to pursue a Marine Engineer career aboard merchant ships.

CHAPTER I

HONDURAS AS A MARITIME NATION

1- PHYSICAL CONSIDERATIONS:

Honduras is located in the heart of Central America, between Guatemala, El Salvador and Nicaragua. It's maritime boundaries include the following countries: Guatemala, Belize, Mexico, Cuba, Jamaica, Grand Cayman (British Colony), Colombia, Nicaragua and El Salvador.

The total area of the country is 112,088 sq. km. The Atlantic Ocean covers up to 650 km. of coast in the the north. The Pacific Ocean forms a gulf with up to 100 km. of coast in the south.

Honduras is located at about 15 degrees of North latitude, and between 86-87 degrees of West longitude. (See figure 1.1 & 1.2).

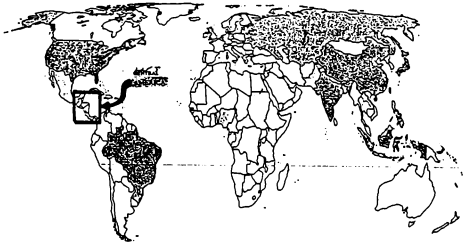


Figure 1.1
CENTRAL AMERICA

Figure 1.2

GEOGRAPHICAL LOCATION OF HONDURAS, MARITIME BOUNDARIES AND ECONOMIC EXCLUSIVE ZONE (NOT OFFICIALLY DEFINED).

1.2- ECONOMIC SITUATION:

Honduras has a population of 4.3 million people according to the latest official census estimate (1989). From these people, there are only around 1.5 million who are economically active. With an unemployment estimate of 35%, a total foreign debt of $ 3,318 millions and only $ 8,104 millions of GDP, this leaves the country in a very unpromising economic future unless

proper measures are taken in order to face present and future economic conditions. Luckily, the present government headed by President Rafael Leonardo Callejas is on the right track in order to restore the deteriorating economy, a legacy of prior governments. With the beginning of his government, a series of economic measures were established in order to return to an eligible status for further credits from the World Bank and the IMF.

There are two rates of the currency (Lempira) that the government is currently applying. The official rate of 2 Lempiras for 1 US$, for government foreign expenses and debt payment, and the parallel rate of approximately 5.5 Lempiras to the dollar for the rest of the economic activities of the country. There is also a high priority repayment program underway in order to pay arrears to both the IMF and the World Bank. This, accompanied by a privatization program for all state owned companies and a decrease of the deficit by a cut of government expenditures has proven so far to be the right medicine to cure the majority of the economic problems of the country.

The black market for US$ has practically vanished. There is a growing tendency of the industry to compete in the export market and of the commercial sector to depend less on imports.

Because of the positive attitude of the current government towards the positive rearrangement of the economy, some rescheduling of the payment of the foreign debt has been granted, accompanied by the acceptance of these payments by the official rate of the currency against the current floating value.

As an overall look at the economy in Honduras, I quote the following: "Despite the bleak outlook for export of major commodities, the business sector will continue to be reassured by the Government's free market strategy and by the resumption of multilateral credits that is expected to follow the adjustment measures. Thus, adequate foreign exchange will be available for the import of raw materials and intermediate goods which could help to produce a modest recovery in investment by 1991".*

* Paul Hacket, South America, Central America and the Caribbean, 1991, pg. 358.

1.3- SEA AND MARITIME RESOURCES:

As shown before, Honduras posseses a large Economic Exclusive Zone (EEZ) that is rich in resources. If exploited properly it could represent a significant asset for the future economical needs of the country.

Some actual figures of the current exploitation of the sea resources and sea activity are the following:

FISHING (metric tons, live weight), 1989.

Fishes	5,030
Shrimps and lobsters	5,710
Others	625
Total catch	11,365

INTERNATIONAL SEA-BORNE SHIPPING (freight 1988 traffic in '000 metric tons).

Goods loaded	1,708
Goods unloaded	1,797

As you can see, there is currently little activity to exploit the vast natural resources that lay within the boundaries of the Economic Exclusive Zone of the country. The existing structure for the exploitation of these resources is privately owned and has proven so far to be very effective in achieving its

objectives; but this activity has been limited to a very small group of the total population of the country.

The natives from the Caribbean based islands (Bay Islands) of Roatan, Utila and Guanaja, make up the group getting the maximum benefit from the existing resources of the EEZ. There is a large fishing industry comprised primarily of lobster, shrimp and fish catching vessels that directly control the total activity of this nature in the country. They have developed their own successful markets, mainly in the United States of America.

This fishing industry, although it represents a very small proportion of the economic active population, is responsible for almost 9% of the total exports of the country.

With respect to the EEZ, the Government should start a project to officially establish the international boundaries of the area in order to protect and properly exploit the resources that lay within it's borders, in accordance with the International Convention in the Law of the Sea.

With respect to it's geographical location, Honduras is located in a very strategic site with respect to the international shipborne trade that goes around the area.

As shown in the above figures, the majority of the international trade of the country takes place by ship, including trade activities for neighboring countries like El Salvador that lack a coastline on the Atlantic Ocean (Dry-Cannal). Honduras has two important ports on the Atlantic coast, Puerto Castilla and Puerto Cortes, the latter being the most important and modern port in the Central America region.

On the Pacific coast there is the port of San Lorenzo, also with very modern facilities. Both are managed by the National Port Authority (Empresa Nacional Portuaria-ENP).

In the Maritime Administration sector, Honduras is a country with a flag of convenience policy, with a large merchant vessel tonnage. The Maritime Administration (called National Merchant Marine-Marina Mercante Nacional) is the branch of the Honduran Navy (Naval Forces of Honduras-Fuerza Naval de Honduras) that controls and regulates all the policies nationwide with respect to Honduran flagged vessels, port captains and all the rules and regulations established by the IMO.

Contained within the policies of the Maritime Administration with respect to the Honduran flagged vessels is the requirement that all vessels should be manned by a qualified Honduran crew if available. Of course, this rule does not apply and is only a technicality to satisfy the labor unions of the country. However, there

is a large proportion of the Honduran population that goes abroad to become ratings not only in Honduran flagged vessels, but others. Although, these people begin with

the basics with respect to job related activities, it is in their will to educate themselves and to qualify and grow up in the ranks in order to improve their job status. The Honduran Maritime Administration has not, up to this point, established any training facilities for the Honduran merchant mariners. There is a training center for technicians in Electronics, Diesel Machinery and Electrotechnology that is run by the Navy that has proven very succesful in graduating people. After their 2-year commitment service with the navy, many either join the national industry or the merchant service abroad in a very successful manner. Also, there is a project now by the National Autonomous University of Honduras (Universidad Nacional Autonoma de Honduras) to start a Maritime University in order to qualify maritime oriented personnel; a new field in education is to be developed in order to maximize the potential for the future development of the country. This university will be located in Puerto Cortes.

1.4- SUMMARY:

From the introduction we can conclude that Honduras is a maritime nation with a large potential in the maritime field. The economic condition of the country is a repercussion of the prior governments that, besides failing to identify the different potentials of the country, also failed to govern with a futuristic view for the proper development of the country as a nation. The reasons for the latter are a combination of factors. What we definitely can conclude now is that due to the present detrimental economic conditions of the country, the current government has had little choice but to explore different areas of development for the proper economic progress of the nation.

The government should develop a maritime program that should include the following steps:

a. Definition of the Honduran maritime borders and the limits of the EEZ in accordance with the International Convention in the Law of the Sea.

b. A thorough and extensive analysis for the proper reorganization of the Maritime Administration in order to fully comply with the different international rules and regulations established by the IMO.

c. The development of training facilities and educational centers in the maritime sector, according to present and future needs of the merchant and fishing mariners of the country.

d. To later enhance these educational programs in order to cover the port administration, shipping management, maritime administration and marine engineering technology sectors of the maritime industry, with emphasis on potential backing from the private sector.

e. To privatize the National Port Authority (ENP).

Once these initial measures take place, with great emphasis in the educational sector, Honduras as a nation will be on the proper track to develop and fully exploit the maritime sector in the near future; bearing always in mind that our future depends only on ourselves.

THE STCW CONVENTION

2.1-GENERAL OVERVIEW:

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), promoted by the IMO and which entered into force in 1984, has become the guideline for shaping maritime education around the world. It establishes and formulates a series of minimum requirements to meet the necessary complexities for maritime education in order to comply with IMO's motto of "Safer Shipping and Cleaner Oceans" on a worldwide basis.

The STCW Convention is basically structured in the following manner:

Chapter 1- General provisions.
Chapter 2- Deck department.
Chapter 3- Engine department.
Chapter 4- Radio department.
Chapter 5- Special requirements for tankers.
Chapter 6- Proficiency in survival craft.

In addition to a series of regulations, there are resolutions and amendments that thoroughly

comprise what we know as the STCW Convention. Honduras, although not signatory to the Convention when established, became a member of it by accesion on the 24th of December, 1985, three months after having signed the document for acceptance. Since no maritime training institutions exist up to this moment in the country, nothing has been done in order to implement the Convention for the purpose of training of seafarers. However, the Convention is currently being used for the purpose of certification of not only Hondurans but other seafarers from around the world since Honduras is a country with flag of convenience. As mentioned earlier, since there are no maritime training institutions in the country, the Maritime Administration is currently certifying the seafarers by accepting certificates issued by approved maritime administrations of other countries. A complete analysis of the Convention will be necessary in order to implement it fully with respect to maritime education and training in the country if a project of this nature is implemented. Then the Maritime Administration will have to incorporate this domestic training with the current policy of issuance of certificates or modify the existing one in order to establish a system that follows both the certification and the training parameters of the Convention.

The current project of the Maritime University of Honduras must coordinate with the Maritime Administration in order to establish an educational system that will fully comply with the Convention. This is necessary for the simple reason that internationally the seafarer has to be fully trained in an environment that has become extremely competitive. It's certification has to match international standards.

2.2- THE ENGINEERING ASPECTS OF THE CONVENTION:

Since the purpose of this paper is to define the most suitable initial stages of a Marine Engineering and Marine Electrical Technology Curriculum for the Honduran Naval Technical School, I am going to emphasize the engineering aspects of the STCW Convention.

As mentioned earlier, Chapter 3 of the Convention deals with the Engine Department (Regulations III/1 to III/6); the following is a breakdown of the requirements established in the chapter:

Regulation III/1:

Basic Principles to be Observed in Keeping an Engineering Watch.

Regulation III/2:

Mandatory Minimum Requirements for Certification of Chief Engineer Officers of Ships Powered by Main Propulsion Machinery of 3000 kW Propulsion Power or More.

Appendix to Regulation III/2:

Minimum knowledge Required for Certification of Chief Engineer and Second Engineer Officers of Ships Powered by Main Propulsion Machinery of 3000 kW Propulsion Power or More.

Regulation III/3:

Mandatory Minimum Requirements for Certification of Chief Engineer Officers-Second Engineer Officers of Ships Powered by Main Propulsion Machinery between 750 kW and 3000 kW Propulsion Power.

Appendix to Regulation III/3:

Minimum knowledge Required for Certification of Chief Engineer Officers and Second Engineer Officers of Ships Powered by Main Propulsion Machinery of between 750 kW and 3000 kW Propulsion Power.

Regulation III/4:

Mandatory Minimum Requirements for Certification of Engineer Officers in Charge of a Watch in a

Traditionally Manned Engine Room or Designated Duty Engineer Officers in a Periodically Unmanned Engine Room.

Regulation III/5:

Mandatory Minimum Requirements to Ensure the Continued Proficiency and Updating of Knowledge for Engineer Officers.

Regulation III/6:

Mandatory Minimum Requirements for Ratings Forming Part of an Engine Room Watch. (See annex 1, 2 & 3).

It is important to mention that the minimum requirements stipulated by the Convention concentrate on both pre-sea and post-sea training aspects of education and certification. I am only going to concentrate in this paper on the pre-sea aspects of it. A complete research for the post-sea part has to be made once the pre-sea portion has been mastered and fully implemented. According to an analysis made on the STCW's Convention requirements on education and training, it establishes a primary concern with respect to safety and pollution prevention. The Convention's requirements can be broadly stated as follows:

-Ship and machinery operational practices and procedures.
-Special practices and procedures to minimize

pollution.
-Watchkeeping practices and procedures.
-Emergency procedures.

The principal components of competency have been stated as knowledge, understanding, skill and experience.

The Convention further identifies knowledge as being theoretical or practical. The Convention provisions and requirements can therefore be broadly grouped as follows:

-The practices and procedures to be used by seafarers in ship and machinery operations in order to attain the highest possible safety with minimum pollution of the environment;

-The theoretical and practical knowledge that the seafarer must have in order to apply and use these practices and procedures.

These practices and procedures can be subdivided into operational and emergency, according to the following:

Operational	Emergency
Watchkeeping (general)	Fire fighting
Watchkeeping (in charge)	First aid
Machinery operation	Personal survival
Machinery maintenance	Damage control
Control systems	
Pollution control	

The knowledge necessary to apply the practices and procedures can be subdivided into theoretical, practical and specialized, according to the following:

Theoretical

Thermodynamics and heat transmission.

Mechanics and hydromechanics.

Operational principles of ship's power installations (diesel, steam and gas turbine) and refrigeration.

Physical and chemical properties of fuels and lubricants. Technology of materials.

Chemistry and physics of fire and extinguishing agents. Marine electrotechnology, electronics and electrical equipment.

Fundamentals of automation, instrumentation and control systems.

Naval architecture and ship construction, and damage control.

Practical

Operation and maintenance of:

-marine diesel engines

-marine steam propulsion plant

-marine gas turbines

Operation and maintenance of auxiliary machinery, including pumping and piping systems, auxiliary boiler plant and steering gear systems.

Operation, testing and maintenance of electrical and control equipment.

Operation and maintenance of cargo handling equipment and deck machinery.

Detection of machinery malfunction, location of faults and action to prevent damage.
Organization of safe maintenance and repair procedures.
Methods of, and aids for fire prevention, detection and extinction.
Methods and aids to prevent pollution of the environment by ships.
Regulations to be observed to prevent pollution of the marine environment.
Effects of marine pollution on the environment.
First aid related to injuries which might be expected in machinery spaces and use of first aid equipment.
Functions and use of life saving appliances.
Methods of damage control.
Safe working practices.

Specialized

International law embodied in international agreements and conventions as they affect the specific obligations and responsibilities of the engine department.
National maritime legislation as it affects the engine departament.
Personnel management.
Shipboard organization and training for engine room personnel.

2.3-SUMMARY:

The STCW Convention has proven very succesful in it's purpose of establishing minimum standards of training and certification procedures for the seafaring community around the world. Although, it is very difficult to adopt stiff measures to establish a system that regulates qualifications of a certain nature for worldwide acceptance, this Convention has excelled in establishing minimum standards and at the same time upgrading the system for what it was designed for.

The current advances in technology are playing an important role with respect to what education and the shipping industry is concerned. This is a very important aspect that the Convention has to consider. I am almost certain that in the near future some amendments will have to be made in order to be able to continue to implement it on a worldwide basis. An example to this could be giving more credit to simulation training for the pre-sea part of the educational process.
In the future, the cost of training cadets onboard could be so high that most of the practice training would have to be done by simulation. Or at the same time, high technology could reach such levels that there will be no need for training cadets onboard.

There is also a very important aspect of the Convention with respect to the Port State Control. This mechanism of control and Convention enforcement is necessary in order to

implement and establish a sense of responsibility in the respective maritime administrations of the countries. It should be our duty to bring this up to the attention of our maritime authorities, in order to avoid future possible casualties or accidents through a simple enforcement of the Port State Control capability that the Convention entitles to the contracting government.

CHAPTER III

THE NAVAL TECHNICAL SCHOOL

3.1- MISSION:

The Naval Technical School is a part of the Naval Studies Center that specializes in technical and military education. It is under the command of the Office of the Chief of the Navy, and under the technical supervision and direction of the Office of the Chief of Staff of the Navy and the School's Director respectively.

The mission of the school is to train technicians for the Honduran Navy in the fields of electronics, electrotechnology and mechanics. Also, the school has the capacity to provide or update professional technical knowledge for officers and auxiliary personnel of the Navy.

3.2- ACADEMIC CURRICULA:

The instructional policy of the Technical School is a hands-on oriented one. It consists of academic modules, adequate training aides, laboratories, shops and excellently trained instructors. The student gets involved completely in the development of the guidelines,

exercises and practical lab work immediately after the theoretical work. The educational philosophy of the school enforces the important role of the student as a learner in the classroom for theoretical knowledge. Also, it depicts the importance that the lab or shop has for practical knowledge and experience, a valuable way of learning the technical aspects of science.

The curricula of the school is divided in general courses common for all, and in specific courses for each field of studies respectively; these include electronics, electrotechnology and mechanics.

General Courses:

-Navigation
-Risk Prevention
-Military Discipline
-Watchstanding
-Naval Traditions
-Military Leadership
-Mathematics
-Physics
-Technical Drawing
-Technical English
-Sports
-Military Law

Electrotechnology:

-Electrotechnology I
-Electrotechnology II
-Circuits Design
-Electrical Install.
-Naval Equipment and Systems
-Basic and Advanced Refrigeration and Air Conditioning
-Electrical Machines
-Control Circuits
-Winding
-Naval Electrical Machines

-Industrial
Electrical
Machines
-Basic Telephony
-Practical Work
-Project and
Investigation

Electronics:

-Elementary Electricity I
-Elementary Electricity II
-Electrical Installations
-Analog Micro-Electronics
-Intermediate Electronics
-Digital Systems I
-Digital Systems II
-Communications
-Telephony
-Microwaves and Radar
-Practical Work
-Project and Investigation
-Basic Electronics I
-Basic Electronics II

Mechanics:

-Welding
-Machine Shop
-Electricity I
-Electricity II
-Plumbing
-Strength of Mat.
-Thermodynamics
-Automotive Elect.
-Internal Combust.
-Detroit Diesel
Engines
-Outboard
Engines
-Automatic Lathe
-Hydraulics
-Engine Practice
-Practical Work

The following is the academic program for Electronics, which like the rest of the courses, is divided into modules:

3.2.1- ELECTRONICS:

Course	hours total	hours week	length weeks
MODULE 1			
Physics	47	7	
Mathematics	40	6	
Basic English	33	5	
Technical Drawing	40	6	
Seamanship	26	4	7
Risks Prevention	26	4	
Military Discipline	28	4	
Sports	28	4	
MODULE 2			
Physics	40	6	
Mathematics	47	7	
Technical English	26	4	
Technical Drawing	26	4	
Elementary Electricity I	40	6	7
Navigation	33	5	
Military Discipline	14	2	
Sports	28	4	
Watchstanding	4	2	

Course	hours total	hours week	length weeks
MODULE 3			
Physics	33	7	
Mathematics	33	7	
Technical English	18	4	
Elementary Electricity II	68	14	5
Watchstanding	20	4	
Sports	20	4	
MODULE 4			
Physics	38	4	
Mathematics	48	5	
Technical English	28	3	
Basic Electronics I	138	14	
Electrical Installations	58	6	10
Watchstanding	10	1	
Sports	40	4	
Military Leadership	30	3	
MODULE 5			
Mathematics	48	5	
Technical English	28	3	
Basic Electronics II	118	12	
Analog Micro-Electronics	138	14	10
Military Leadership	20	2	
Sports	40	4	

Course	hours total	hours week	length weeks
MODULE 6			
Mathematics	28	3	
Intermediate Electronics	148	15	
Digital Systems I & II	158	16	10
Military Law	20	2	
Sports	40	4	
MODULE 7			
Communications	110	14	
Microwaves and Radar	158	20	
Military Law	8	1	9
Sports	36	4	
Practical Work	30	30	
Naval Traditions	2	2	
MODULE 8			
Telephony	110	16	
Practical Work	124	18	
Naval Traditions	1ø	2	7
Sports	28	4	
Project and Investigation	160	40	4

3.2.2- ELECTROTECHNOLOGY:

Course	hours total	hours week	length weeks
MODULE 1			
Physics	47	7	
Mathematics	42	6	
Basic English	33	5	
Technical Drawing	40	6	
Seamanship	26	4	7
Risks Prevention	26	4	
Military Discipline	28	4	
Sports	28	4	
MODULE 2			
Physics	40	6	
Mathematics	47	7	
Technical English	26	4	
Technical Drawing	26	4	
Electrotechnology I	40	6	7
Navigation	33	5	
Military Discipline	14	2	
Sports	28	4	
Watchstanding	14	2	
MODULE 3			
Physics	33	7	
Mathematics	33	7	
Technical English	18	4	
Electrotechnology II	68	14	5
Watchstanding	20	4	
Sports	20	4	

Course	hours total	hours week	length weeks
MODULE 4			
Mathematics	48	5	
Technical English	38	4	
Electrical Circuits Design	148	15	
Electrical Installations I	78	8	10
Watchstanding	10	1	
Sports	40	4	
Military Leadership	30	3	
MODULE 5			
Mathematics	33	5	
Technical English	26	4	
Naval Equipment and Systems	61	9	
Elementary Refrigeration	110	16	7
Military Leadership	14	2	
Sports	28	4	
MODULE 6			
Mathematics	43	5	
Adv. Refrigeration & A.C	198	22	
Electrical Machines I	61	7	
Military Law	18	2	
Sports	40	4	
Practical Work	40	40	
Military Leadership	2	2	

Course	hours total	hours week	length weeks
MODULE 7			
Control Circuits	100	17	
Rewinding	100	17	
Military Law	12	2	6
Sports	24	4	
MODULE 8			
Naval Electrical Machines	152	14	
Industrial Elect.Machines	130	12	11
Basic Telephony	88	8	
Naval Traditions	26	2	
Practical Work	68	34	2
Sports	52	4	

3.2.3- MECHANICS:

Course	hours total	hours week	length weeks
MODULE 1			
Physics	47	7	
Mathematics	42	6	
Basic English	33	5	
Technical Drawing	40	6	
Seamanship	26	4	7
Risks Prevention	26	4	
Military Discipline	28	4	
Sports	28	4	
MODULE 2			
Physics	42	4	
Mathematics	42	4	
Technical English	31	3	
Technical Drawing	42	4	
Welding	31	3	
Machine Shop	64	6	11
Electricity I	53	5	
Navigation	31	3	
Military Discipline	14	1	
Sports	44	4	
Watchstanding	30	3	

Course	hours total	hours week	length weeks
MODULE 3			
Physics	22	4	
Mathematics	22	4	
Technical English	22	4	
Electricity II	70	12	
Welding	22	4	6
Technical Drawing	22	4	
Watchstanding	12	2	
Sports	24	4	
MODULE 4			
Physics	28	5	
Mathematics	28	5	
Technical English	16	3	
Welding	46	8	
Plumbing	40	7	6
Technical Drawing	22	4	
Military Discipline	12	2	
Sports	24	4	

Course	hours total	hours week	length weeks
MODULE 5			
Mathematics	19	3	
Technical Drawing	26	4	
Technical English	19	3	
Welding	54	8	
Plumbing	26	4	7
Strength of Materials	40	6	
Thermodynamics	40	6	
Military Leadership	14	2	
Sports	28	4	
MODULE 6			
Mathematics	26	4	
Technical English	26	4	
Technical Drawing	26	4	
Automotive Electricity	54	8	7
Internal Combustion Engines	96	14	
Military Leadership	14	2	
Sports	28	4	

Course	hours total	hours week	length weeks
MODULE 7			
Outboard Engines	110	16	
Detroit Diesel Engines	68	10	
Automatic Lathe	54	8	
Sports	28	2	7
Military Law	4	4	
Military Leadership	10	2	
MODULE 8			
Automatic Lathe Practice	30	30	
Military Law	2	2	1
Sports	4	4	
Detroit Diesel Eng.Practice	260	20	
Hydraulics	182	14	
Sports	52	4	13
Naval Traditions	14	1	

3.3- COURSE CONTENTS:

Since, in this project, I am only interested in the electrotechnology and mechanics curricula of the school, I will skip the electronics curriculum, except for those basic courses that are taught in the electrotechnology and mechanics areas. The reason for this is that these are the only curricula that apply to the marine engineering field. Besides, I am only going to include those courses that are pertinent to the marine engineering curriculum. This means excluding the military and naval subjects.

3.3.1-ELECTROTECHNOLOGY

Physics

Duration: 132 hours

Modules: 3

Objective: To stimulate and develop student interest in the physical phenomena. To develop in the student the observation and analytical ability through experimentation in laboratory work.

Module 1. -Measurement, Units and Vectors.
-Kinematics.

Module 2. -Electric potential energy.
-Electric current.

Module 3. -Electromotive force in simple circuits.
-Magnetic field.
-Electromagnetic induction.

Mathematics

Duration: 234 hours

Modules: 6

Objective: To teach the student the fundamental principles of algebra, trigonometry and calculus, in which most of theoretical knowledge of his studies will be based upon.

Module 1. -Algebra.
-Operations with polynomials.
-First degree equations.
-Polynomial's factorization.

Module 2. -First degree simultaneous equations with two unknowns.
-Inequalities.
-Simultaneous equations with many unknowns.
-Logarithms and anti-logarithms.

Module 3. -Trigonometry.
-Trigonometric functions.
-Trigonometric identities.

Module 4. -Calculus.
-Limits.

Module 5. -Derivation.

Module 6. -Integration.

Technical Drawing

Duration: 63 hours

Modules: 2

Objective: To apply technical drawing principles to the electrical distribution system's layout of a project.

Module 1. -Introduction.
-The line.
-Drafting format.
-Letters and numbers.
-Scales.

Module 2. -Ortographic projection.
-Tools drawing.
-Assembly drawing.

Risk Prevention

Duration: 28 hours

Objective: To provide the student the safety knowledge when working with electrical equipment.

-Introduction.
-Danger with power supplies.
-Working with power supplies.
-Electric shops.

Electrotechnology I

Duration: 42 hours

Objective: To provide the student the basic knowledge about electricity and it's application in electrotechnology.

-Introduction.
-Resistors.
-Capacitors.
-Inductors.
-Transformers.
-Diodes.
-Practical work.

Electrotechnology II

Duration: 70 hours

Objectives: To provide the student the necessary knowledge in order to interpret electric systems simbols and layouts, with both the American and European systems.

-Electric simbols.
-Switch on circuits and compoñents.
-Multiple applications and designs.
-Building's layout interpretation.
-The relay in control circuits.
-Multiple applications and designs.

Electrical Circuits Design

Duration: 150 hours

Objectives: To provide the student the required knowledge in order to design electrical circuits, together with

all the technical calculations and system's layouts, according to the respective codes.

-Introduction.
-Cabling systems' components.
-Electrical installations components.
-Electrity sources.
-Materials for installations.
-Control equipment.
-Power connectors.
-Control through switching.
-Shunt circuits.
-Lightning installations.
-Equipment selection.
-Voltage regulators.
-AC and DC motors.
-Signaling systems.
-Alarm systems.

Electrical Installations I

Duration: 70 hours

Objectives: To provide the student the ability to make electrical installations through shop work.

-Rigid wires.
-Flexible wires.
-Connection boxes.
-Distribution boxes.
-Switches.
-Illumination systems.
-Control systems.
-Display systems.
-Fluorescent lamps.
-Feeding systems.

Naval Equipment and Systems

Duration: 63 hours

Objectives: To introduce the student to the electrical systems aboard vessels.

-Distribution systems.
-Degaussing systems.
-Display and monitoring systems.
-The gyrocompass.
-Ship command system.
-Telephone communications onboard.

Elementary Refrigeration

Duration: 112 hours

Objective: To introduce the student to the world of refrigeration and air conditioning.

-Refrigeration fundamentals.
-Basic system.
-Compressors.
-Evaporators.
-Condensators.
-Expansion components.
-Control components.
-Electrical circuits.
-Piping.
-Refrigerants.
-Refrigeration cabinet.
-Fault detection and troubleshooting.
-Psychromatic table.
-Reversed cycle (Heating).

Electrical Machines I

Duration: 63 hours

Objective: To provide the student the theoretical and practical knowledge for the performance of electrical machines.

-Generators.

-Alternators.

-Transformers.

-Motors.

-Control equipment.

Control Circuits

Duration: 102 hours

Objective: To introduce the student to automation and control systems through theoretical and practical work.

-Fundamentals.

-Design.

-Applications.

Winding

Duration: 96 hours

Objective: To provide the student the necessary knowledge in order to wind AC and DC electrical motors.

-Electrical motors' structure.

-Fault finding.

-Taking the motor apart.

-Conductors and insulators for winding.

-Fabrication of rotors.

-Practical work.

Electrical Naval Machines Installation

Duration: 96 hours

Objective: To provide the student the ability to differentiate between a conventional and naval electrical equipment installation. Also, to introduce the student to the vessel's electrical rules and codes for electrical systems.

-General rules.
-Cabling components.
-Design and calculations.
-Measuring instruments.
-Onboard installations.

Industrial Electrical Installations

Duration: 108 hours

Objective: To provide the student with necessary knowledge about rules and codes for industrial electrical installations.

-Cabling systems components.
-Power supply.
-Materials.
-Control equipment.
-Conductors.
-Testing.
-Applications.

3.3.2- MECHANICS

Physics

Duration: 117 hours

Objective: To provide the student the ability to understand fully the physical phenomena through practice and theory.

-Measurement, units and vectors.
-Kinematics.
-Newton's laws.
-Force.
-Work and energy.
-Mechanics of fluids.
-Heat and temperature.
-Gases.
-First law of thermodynamics.
-Second law of thermodynamics.

Mathematics

Duration: 166 hours

Objective: To introduce the student to the mathematical principles in science, and it's applications in mechanics.

-Algebra.
-Polynomials.
-First degree equations.
-Factorization.
-Simultaneous equations with two unknowns.
-Simultaneous equations with many unknowns.
-Trigonometry.
-Law of sines and cosines.
-Geometry.

-Area and perimeter of plane geometric figures.
-Volume of bodies.
-Calculus.
-Limits.
-The derivative.
-The integral.

Technical Drawing

Duration: 181 hours

Objective: To introduce the student to the application of technical drawing for graphic representation of mechanical components and parts of machines.

-The line.
-Lettering and numbers.
-Scales.
-Descriptive representation.
-The figures.
-Cross-sectional views.
-Pipes and tubes drawing.
-Gears.
-Design.

Welding

Duration: 161 hours.

Objective: At the termination of the course the student should be able to practice welding with all equipments and in all kinds of positions.

-Arc welding.
-Introduction to the equipment.
-Butt welding with scarf.

-Flat welding.
-Lap welding.
-Spot welding.
-Welding seam.
-Upward, downward welding, etc.
-Gas welding.
-Oxyacetilene equipment.

Mechanical Shop

Duration: 66 hours

Objective: To introduce the student to the tools and equipment used in the mechanical shop and it's applications.

-Measurement.
-Tools.
-Characteristics of metals.
-Pipe bending machines.
-Shears.
-Chasing.

Plumbing

Duration: 63 hours

Objective: To introduce the student to the tools and equipment used in plumbing, and it's different applications.

-Measurement.
-Tools.
-Tube cutting and chasing.
-Tube connections and welding.
-Leveling.
-Pipe bending.
-Water proofing.
-Drawings and layout interpretation.

Strength of Materials

Duration: 42 hours

Objective: To provide the student the knowledge in what stress and strain, deformation, shear and loads on materials is based upon.

-Statics.
-Stress.
-Strain.
-Mechanical properties of materials.
-Loads.
-Deformation.
-Shear.
-Beam analysis.

Thermodynamics

Duration: 40 hours

Objective: To provide the student the background necessary in thermodynamics for the understanding of internal combustion engines.

-Units.
-Conversion factors.
-Pressure.
-Temperature.
-Heat and work.
-Ideal gases.
-Otto cycle.
-Diesel cycle.

Elementary Electricity I

Duration 42 hours

Objective: To introduce the student to the basics of electricity and it's application for mechanics.

-Electricity.

-Series and parallel circuits.

-Bell and lamp circuits, combinations and applications.

-Signaling.

Elementary Electricity II

Duration: 70 hours

Objective: To introduce the student to more complex electric components, and it's applications to mechanics.

-Resistor.

-Capacitor.

-Inductor.

-Transformer.

-Diode.

-Transistor-Relays.

-Switching.

-Motors.

Internal Combustion Engines

Duration: 98 hours

Objective: To introduce the student to the operation and performance of internal combustion engines. Also, to assemble and disassemble simple engines.

-Gasoline and diesel engines.
-Stationary parts.
-Moving parts.
-Engine accesories.
-Two stroke engine.
-Four stroke engine.
-Fault finding and repairs.

Outboard Engine

Duration: 110 hours

Objective: To provide the knowledge to the student about the operation and performance of outboard engines. To assemble and disassemble this type of engine.

-Tools.
-Feeding system.
-Carburator and pump.
-Moving parts.
-Electrical system.
-Gear box.
-Cooling system.
-Fault finding and repairs.

Detroit Diesel and MTU Engines

Duration:356 hours

Objective: To familiarize the student with the engines used aboard the Honduran Navy vessels. To assemble and disassemble these engines, and to do practice work and repairs aboard.

-Different types.

-Different systems and components.

-Practice aboard.

-Assemble and disassemble.

-Fault finding and repairs.

Hydraulics

Duration: 156 hours

Objective: To introduce the student to hydraulic systems and their applications.

-Basic physical laws.

-Main components of the system.

-Working procedure.

-Electrohydraulic systems.

CHAPTER IV

THE NEW NAVAL TECHNICAL SCHOOL

4.1- MISSION:

The new mission of the Naval Technical School will be expanded to the following:

-Training technicians for service in the Navy, and providing these people the pre-sea training qualifications in marine electricity and marine engineering.

This will be of great benefit to those interested in following a career in the merchant navy, either nationally or internationally, after their military service with the Navy.

This new mission of the school will serve the economic and social interest of the government. It will provide a new career option for people complying with the obligatory military service. Proper education and training will enable them to begin a career with a solid background that will enhance their opportunities for future personal progress and professionalism.

In addition, this mission will also attract more and better people to the school since it will be

offering a much better and applicable program for future personal development.

The school's original academic program offers three majors: Electrotechnology, Electronics and Mechanics (Diesel-Machinery). This main structure will continue to apply but I will be excluding the electronics part of it because it is not applicable for qualification aboard any type of merchant vessels. This means that this program will only apply for those following the electrotechnology and diesel machinery areas of study. The electronics technicians will either follow the same pathline established up to this point or incorporate themselves into a more complete two year program.

4.2- ACADEMIC PROGRAM:

The Naval Technical School will provide a two year academic program leading to a certification in either Marine Engineering Technology (Diesel Machinery) or Marine Engineering Technology (Electrotechnology). It will be linked to national higher technical educational system of the country. A qualification certificate from the Maritime Administration as rating nominated Assistant to the Engineering Officer in Charge of the Watch or as Assistant to the Ship Electrical Officer and a commission in the Honduran Navy as technician petty officer 3rd

class will also be obtained upon graduation.

The academic year will be divided into four academic quarters which span nine months, generally from mid January to mid December, plus a one month sea period aboard the training ship. Credit for courses will be given in quarter hours.

The first two academic quarters will be common for all students, where they will concentrate on general courses in mathematics and science necessary for all majors. In the third quarter the students will split to their own respective major, although during the two year period all students may take some courses together.

There will be a required Technical English program that will be taken during the two year period. This program will be divided into eight courses, offered on each academic quarter. Each course will correspond to a level of proficiency. An English proficiency entrance examination will be administered to all students in order to determine their level and respective entrance course.

For those students validating courses in English, they will begin with their respective level according to the entrance examination results. Once the last course is taken succesfully, they will have completed the program.

4.2.1- MAJOR PROGRAMS:

The students will select their major course of study from two programs:

a- Marine Engineering Technology, (Diesel Machinery).

b- Marine Electrical Technology, (Electrotechnology).

A program sequence is depicted in order to illustrate how the program is implemented. Also, a detailed explanation of the two majors and it's respective course content description is given later in this chapter.

The following is the academic program sequence description for both majors listed above.

It is important to mention that around 70 percent of the academic work at the school is either laboratory or shop type of work. This means that although it may seem that the student is overloaded with credit hours, actually it should count as half of credit, since most of it is lab or shop work. Besides, at the present, the school is running perfectly under this type of schedule and conditions.

YEAR 1
DIESEL MACHINERY

QUARTER 1

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
MM-101 PRE-CALCULUS I	5	--	5	40
PH-101 PHYSICS I	5	--	5	40
TE-101 TECHNICAL ENGLISH I	3	2	5	40
CH-101 CHEMISTRY I	3	2	5	40
TI-101 INFORMATION TECHNOLOGY I	3	2	5	40
TD-101 TECHNICAL DRAWING I	--	5	5	40
TOTAL	19	11	30	240

[SH] FF-100 FIRE FIGHTING / BREATHING APPARATUS

QUARTER 2

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
MM-102 PRE-CALCULUS II	5	--	5	40
PH-102 PHYSICS II	5	--	5	40
TE-102 TECHNICAL ENGLISH II	3	2	5	40
CH-102 CHEMISTRY II	3	2	5	40
TI-102 INFORMATION TECHNOLOGY II	3	2	5	40
TD-102 TECHNICAL DRAWING II	--	5	5	40
TOTAL	19	11	30	240

[SH] FA-100 FIRST AID / CPR

QUARTER 3

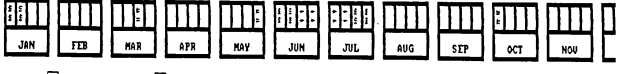
COURSE	HOURS CLASS	LAB.	WEEK	QUART.
MM-201 CALCULUS I	5	--	5	40
TE-103 TECHNICAL ENGLISH III	3	2	5	40
MS-101 MACHINE SHOP I	--	10	10	80
EE-100 BASIC ELECTRICITY	3	2	5	40
ME-100 MECHANICS & STRENGTH OF MATERIALS	3	2	5	40
TOTAL	14	16	30	240

[SH] PS-100 PERSONAL SURVIVAL

QUARTER 4

COURSE	HOURS CLASS	LAB.	WEEK	QUART
MM-202 CALCULUS II	5	--	5	40
TE-104 TECHNICAL ENGLISH IV	3	2	5	40
MS-102 MACHINE SHOP II	--	10	10	80
EL-100 BASIC ELECTRONICS	3	2	5	40
TH-100 THERMODYNAMICS	5	--	5	40
TOTAL	16	14	30	240

YEARLY SCHEDULE



- SCHOOL TIME (WEEK)
- [SH] SPECIAL QUALIFICATION
- SEA TRAINING
- VACATION
- END OF YEAR (WRAP UP)

YEAR 2
DIESEL MACHINERY

QUARTER 5

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-105 TECHNICAL ENGLISH V	2	3	5	40
SM-201 DIESEL MACHINERY I	6	6	12	96
FM-101 FLUID MECHANICS I	3	--	3	24
SM-301 DIESEL PLANT OPERATION & MAINTENANCE I	4	6	10	80
TOTAL	15	15	30	240

[##] DC-100 DAMAGE CONTROL

QUARTER 6

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-106 TECHNICAL ENGLISH VI	2	3	5	40
SM-202 DIESEL MACHINERY II	6	6	12	96
FM-102 FLUID MECHANICS II	3	--	3	24
SM-302 DIESEL PLANT OPERATION & MAINTENANCE II	4	6	10	80
TOTAL	15	15	30	240

[##] PC-100 POLLUTION CONTROL

QUARTER 7

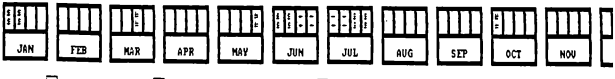
COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-107 TECHNICAL ENGLISH VII	5	--	5	40
HY-101 HYDRAULICS I	4	6	10	80
PM-101 PNEUMATICS I	2	1	3	24
SA-101 DIESEL AUXILIARY EQUIPMENT I	6	6	12	96
TOTAL	17	13	30	240

[##] MARAD CONFERENCE: CERTIFICATION PROCESS

QUARTER 8

COURSE	HOURS CLASS	LAB.	WEEK	QUART
TE-108 TECHNICAL ENGLISH VIII	5	--	5	40
HY-102 HYDRAULICS II	4	6	10	80
PM-102 PNEUMATICS II	2	1	3	24
SA-102 DIESEL AUXILIARY EQUIPMENT II	6	6	12	96
TOTAL	17	13	30	240

YEARLY SCHEDULE



[ ] SCHOOL TIME (WEEK) [#] SPECIAL QUALIFICATION [*] SEA TRAINING [@] VACATION [X] END OF YEAR (WRAP UP)

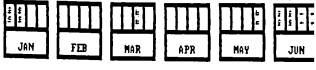
QUARTER 1				
COURSE	HOURS CLASS	LAB.	WEEK	QUART.
MM-101 PRE-CALCULUS I	5	--	5	40
PH-101 PHYSICS I	5	--	5	40
TE-101 TECHNICAL ENGLISH I	3	2	5	40
CH-101 CHEMISTRY I	3	2	5	40
TI-100 INFORMATION TECHNOLOGY I	3	2	5	40
TD-101 TECHNICAL DRAWING I	--	5	5	40
TOTAL	19	11	30	240

[##] FF-100 FIRE FIGHTING / BREATHING APPARATUS

QUARTER 3				
COURSE	HOURS CLASS	LAB.	WEEK	QUART.
MM-201 CALCULUS I	5	--	5	40
TE-103 TECHNICAL ENGLISH III	3	2	5	40
ES-101 ELECTRIC SHOP I	--	5	5	40
EE-201 ELECTRICITY I	5	--	5	40
EL-201 MARINE ELECTRONICS I	5	--	5	40
TH-100 THERMODYNAMICS	5	--	5	40
TOTAL	23	7	30	240

[##] PS-100 PERSONAL SURVIVAL

YEARLY



[ ] SCHOOL TIME (WEEK)

[M] SPECIAL QUALIFICATION

YEAR 2
ELECTROTECHNOLOGY

QUARTER 5

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-105 TECHNICAL ENGLISH V	2	3	5	40
CC-101 MARINE COMMUNICATIONS I	3	2	5	40
AC-101 MARINE REFRIGERATION & AIR CONDITIONING I	4	6	10	80
EE-301 ELECTRICAL MOTORS & GENERATORS I	4	6	10	80
TOTAL	13	17	30	240

DC-100 DAMAGE CONTROL

QUARTER 6

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-106 TECHNICAL ENGLISH VI	2	3	5	40
CC-102 MARINE COMMUNICATIONS II	3	2	5	40
AC-102 MARINE REFRIGERATION & AIR CONDITIONING II	4	6	10	80
EE-302 ELECTRICAL MOTORS AND GENERATORS II	4	6	10	80
TOTAL	13	17	30	240

PC-100 POLLUTION CONTROL

QUARTER 7

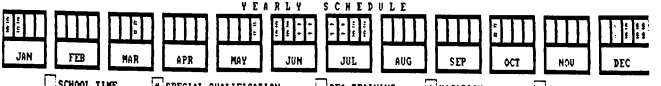
COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-107 TECHNICAL ENGLISH VII	5	--	5	40
EE-401 MARINE ELECTRICAL INSTALLATIONS I	4	6	10	80
AC-103 MARINE REFRIGERATION & AIR CONDITIONING III	4	6	10	80
PT-101 POWER SUPPLY & TRANSFORMERS I	2	3	5	40
TOTAL	15	15	30	240

MARAD CONFERENCE: CERTIFICATION PROCESS

QUARTER 8

COURSE	HOURS CLASS	LAB.	WEEK	QUART.
TE-108 TECHNICAL ENGLISH VIII	5	--	5	40
EE-402 MARINE ELECTRICAL INSTALLATIONS II	4	6	10	80
PT-102 POWER SUPPLY & TRANSFORMERS II	2	3	5	40
EE-502 MARINE ELECTRICAL AUXILIARY EQUIPMENT I	2	3	5	40
DS-100 AUTOMATION & CONTROL	3	2	5	40
TOTAL	16	14	30	240

YEARLY SCHEDULE



4.2.3- GENERAL PROVISIONS:

The academic entry requirements will be regular or technical high school graduation. There will also be an entrance examination in the following subjects in order to make an assessment of the candidate's academic capabilities: mathematics (algebra, geometry and trigonometry), physics, chemistry and technical English. The basic qualifying scores will be determined by the school for each entering class.

The grading system will be based on a numerical (100 points) system, as the following table describes:

90-100 points.....excellent
80-89 " .....very good
70-79 " .....good
60-69 " .....average
59 and below .....failure

The minimum passing grade for an individual course will be 60 points and the overall percentage for graduation requirements will be 60 percent.

The daily schedule will be divided into 6 academic periods as illustrated in the following table:

TIME	PERIOD
0800-0900 hours	1
0900-1000 "	2
1000-1100 "	3
1100-1200 "	4
1300-1400 "	5
1400-1500 "	6

Each academic period will consist of 50 minutes.

An honor system will apply for academics where there will be absolutely zero tolerance to cheating.

As mentioned earlier, there will be two sea training periods aboard the training ship FNH-252 YOJOA. These sea training periods will be credit bearing, faculty supervised educational periods in order to introduce the student to the real life aspects of the career that he has chosen to follow. An evaluation performance report of the student during the sea period will be generated and will be based on the same numerical value as stated above. A minimum passing grade of 60 percent will be required. The first sea period will be made as an Engineroom Rating, and the second as a

Fourth Engineer or Assistant to the Third Engineer for those in the Marine Engineering Technology major. Alternatively, in the first as Electrician Apprentice and the second as Ship Electrician for those in the Marine Electrical Technology major. The student will be required to perform the duties of that position that they will be serving as during these sea training periods.

In addition, there will be a permanent maintenance program that will run all year around aboard the training ship. The students will work through a watch bill system to periodically go onboard to provide basic maintenance and repairs to the ship. This program will provide the student with familiarization and on the job training experience in the onboard working environment, very necessary for the proper adaptation to his new career. A project study has to be made in order to implement the proper onboard training program.

The following are the most important characteristics of the training ship YOJOA:

Name.....YOJOA
Hull number.....FNH-252
Date of launching.....1939
Class.....Hollyhock
Type.....Buoy tender
Length.....175 feet
Width.....34 "

Beam.....12 "
Main engines.....2 diesels (medium speed)
Shafts.....2
Complement.....40 (5 officers/35 enlisted)

A former U.S. Coast Guard buoy tender, she was redesignated a coastal tender on January 1965. She was transferred to the Honduran Navy in 1983. In 1987, she went to a shipyard for overhauls. After this overhaul, she was left in such excellent condition that I consider it could be of great benefit to use it as a training ship.

4.6- COURSE CONTENTS:

The following is a general description of the course contents, divided into the different departments that comprise the school.

A- DEPARTMENT OF MATHEMATICS AND SCIENCE:

This department will be offering courses in basic sciences: mathematics, physics and chemistry.

Since the high school educational system in Honduras is very poor in the above subjects, this department will play an important role in bringing the student up to a satisfactory level the first two quarters of the first year of studies. Also, this department, in conjuntion with the English Department, will be responsible

for the entrance examination in order to diagnose the candidate's capability and condition to cope with the demanding academic curriculum of the school.

MM-101 PRE-CALCULUS I

-basic algebra
-logarithms
-lines
-quadratic equations
-exponentiation

MM-102 PRE-CALCULUS II

-geometry (lines, circles)
-elementary functions and their graphs
-trigonometry (relations and identities)
-law of sines/cosines

MM-201 CALCULUS I

-functions and limits
-the derivative
-differential rules

MM-202 CALCULUS II

-the definite integral
-area under a curve
-integration techniques

PH-101 PHYSICS I

-kinematics (linear, angular relative motion)
-friction
-system of forces
-work, energy, power

PH-102 PHYSICS II

-dynamics (centripetal centrifugal forces)
-simple machines
-elasticity
-heat

CH-101 CHEMISTRY I

-structure of matter
-chemical bonding
-states of matter
-equilibrium

CH-102 CHEMISTRY II

-acids, bases, ph
-hydrolysis
-electrolysis
-corrosion

TI-101 INFORMATION TECHNOLOGY I

-history of computers
-use and reasons for use in the marine environment
-word processing

TI-102 INFORMATION TECHNOLOGY II

-data bases
-spread sheets

B- ENGLISH DEPARTMENT:

The existing department of the school will be rearranged in such a way that it will have to satisfy the parameters established in the academic program.

C- ELECTROTECHNOLOGY DEPARTMENT:

An already well established department at the school, this department will be offering basic electricity courses for the non-electrical majors.

EE-100 BASIC ELECTRICITY

-basic components.
-simple linear dc and ac circuits
-electromagnetism
-dc and ac motors and generators
-tools and measuring

EE-201 ELECTRICITY I

-circuits components
-circuit analysis (laws and methods)
-dc, ac and transient phenomena
-tools and measuring

EE-202 ELECTRICITY II

-impedance
-real, apparent power
-data comparison
-troubleshooting

EE-301 ELECTRICAL MOTORS & GENERATORS I

-power generation
-dc and ac rotating
-power systems

EE-302 ELECTRICAL MOTORS AND GENERATORS II

-equipment teardown
-operation
-maintenance and repair

EE-401 MARINE ELECT. INSTALLATION I

-diagram analysis
-dc and ac distribution
-systems layout (onboard)

EE-402 MARINE ELECT. INSTALLATION II

-fault finding
-protection, coordination
-installation practice

EE-200 ELECTRICITY AND MAGNETISM

-dc circuits and instruments
-electromagnetism
-induction

ES-101 ELECTRIC SHOP I

-tools and equipment
-electrical measurement

ES-102 ELECTRIC SHOP II

-basic equipment repair
-maintenance

CC-101 MARINE COMMUNICATIONS I

-principles of communication theory
-AM and FM

CC-102 MARINE COMMUNICATIONS II

-marine communications equipment
-operation and maintenance

PT-101 POWER SUPPLY AND AND TRANSFORMERS I

-theory of operation
-systems representation
-components

PT-102 POWER SUPPLY TRANSFORMERS II

-marine equipment
-operation
-maintenance and repair

EE-500 MARINE ELECTRICAL AUXILIARY EQUIPMENT

-auxiliary equipment
-fault finding
-maintenance and repair

AC-101 MARINE REFRIGERATION AND A/C EQUIPMENT I

-thermodynamics of of reversed carnot cycle
-thermal, physical, chemical properties of refrigerants
-system analysis and components

AC-102 REFRIGARATION AND A/C EQUIPMENT II

-individual ac units
-central ac units

AC-103 REFRIGERATION AND A/C III

-refrigeration units
-basic system project

D- ELECTRONICS DEPARTMENT:

A very complete department at the school, although not included in this project because of the reasons explained before, it will play an important role in offering courses to those non-electronic majors.

EL-100 BASIC ELECTRONICS

-dc and ac circuits
-diodes, transistors
-operational amplifiers
-digital logic-rectifiers

DS-100 AUTOMATION AND CONTROL

-digital logic
-gates
-TTL
-flip-flops, counters

EL-201 MARINE ELECTRONICS I

-dc and ac circuits
-diodes, transistors
-operational amplifiers

EL-202 MARINE ELECTRONICS II

-filters, power supplies power
-feedback, oscillator

E- DIESEL MACHINERY DEPARTMENT:

Probably the department with the most important role in this project, it is characterized as being the most suitable and the one with the best and most applicable equipment for the marine engineer career.

Probably the majority of those students interested in following a marine engineering career are going to come and go from this department, so it's organization and curriculum will be responsible for providing a complete and sound program.

TD-101 TECHNICAL DRAWING I

-introduction to graphics: use & maintenance of instruments & equipment
-lines, lettering, dimensioning
-orthographic projection

TD-102 TECHNICAL DRAWING II

-tools drawing
-assembly drawing

MS-101 MACHINE SHOP I

-hand tools
-power tools
-general safety
-machinery fittings & equipment, plumbing

MS-102 MACHINE SHOP II

-workshop machines
-electric welding
-gas welding
-cutting
-MIG, TIG

ME-100 MECHANICS & STRENGTH OF MATERIALS

-stress
-strain
-loads (axial, torsional)
-material testing

TH-100 THERMODYNAMICS

-first law, second law
-entropy, enthalpy
-power cycles
-refrigeration cycle

SM-301 DIESEL PLANT OPERATION AND MAINTENANCE I

-basic servicing schedule
-engineroom maintenance
-plant operation
-gearboxes, propellers &
-shafting operation

SM302-DIESEL PLANT OPERATION AND MAINTENANCE II

-watchkeeping & daywork routine
-engineroom logbook
-instructions
-preparation for sea

SA-101 DIESEL AUXILIARY EQUIPMENT I

-pumping system (cooling water,lubricating & fuel oil systems)
-basic servicing
-maintenance

SA-102 DIESEL AUXILIARY EQUIPMENT II

-air compressor,
-fresh water generators
-oily water separators
-basic servicing
-maintenance

FM-101 FLUID MECH. I

-fluid statics
-buoyancy & stability
-forces on submerged surfaces
-pressure measuring

FM-102 FLUID MECHANICS II

-Bernoulli's equation
-incompressible fluids flow

HY-101 HYDRAULICS I

-hydraulic press theory
-working fluids
-basic equipment

HY-102 HYDRAULICS II

-marine hydraulic equipment
-maintenance & repair

PN-101 PNEUMATICS I

-theory of work
-valves

PN-102 PNEUMATICS II

-basic system
-applications

SM-101 DIESEL MACHINERY I

-diesel cycle theory
-basic configuration
-two & four stroke

SM102 DIESEL MACHINERY II

-fuel injection system
-piston & rings
-valves
-crankshaft & bearings

CHAPTER V

PATHLINE FOR CERTIFICATION AND LICENSING

5.1- BACKGROUND:

At present, the Maritime Administration of Honduras is following verbatim the STCW Convention for certification purposes. (See annex 4, 5 and 6).

Besides, as mentioned earlier, since Honduras posseses a flag of convenience, acceptance of certificates from recognized maritime administrations of other countries is common practice.

Hence, any Honduran seafarer or other sailing on a vessel under the Honduran flag, is required to get a certificate through the Maritime Administration. (See annex 7). This certificate could be obtained through the Main Office located in the capital Tegucigalpa, or through the Maritime Safety Office of Honduras (MSOH) located in Miami, USA.

As mentioned above, these certificates will be issued if the applicant fulfills the minimum requirements established by the STCW.

5.2- INITIAL CERTIFICATION PROCEDURE

This procedure will concentrate only on the future graduates of the Naval Technical School, subject of this proposed program. I will concern myself with the current procedure for certification and licensing for the seafarers of Honduras.

Although the graduate from this program would have gone through an intensive 2 year academic curriculum including the sea training period, there will still be a lack of onboard training and hands on experience for him. His qualification after school will be either Assistant to the Engineer Officer in Charge of the Watch or Assistant to the Ship Electrical Officer.

This means that some sea service requirement will be needed in order to further qualify these people. Besides, an examination will also be required for the achievement of the next certification or license.

The initial qualification pathline for the Marine Engineering (Diesel-Machinery) graduate to follow for certification purposes is the following:

- Engineer Watch Officer or Third Engineer (Limited and Unlimited). To have graduated

from the Naval Technical School and have obtained the certification of Assistant to the Engineer Officer in Charge of the Watch. 24 months of approved sea service.

For the graduate in the Marine Engineering (Electrotechnology) program, the pathline for initial qualification is the following:

- Ship Electrical Officer. To have graduated from the Naval Technical School and have obtained the certification of Assistant to the Ship Electrical Officer. 24 months of approved sea service

Once the above certifications have been achieved the continuing process for certification and licensing will be the same that the MARAD currently utilizes. This current process is exactly what the STCW establishes.
(See annex 8).

5.3- SUMMARY:

The Honduran Maritime Administration is currently following the framework established by STCW for the certification and licensing of it's seafarers.

There has been an introductory sea service requirement for the Naval Technical School graduate, in order to compensate for the lack of sea training and hands on experience on the project's program.

Once the above sea service time and MARAD's examination have been completed succesfully, the seafarer will receive the respective certification. Then, the process for future certification will fall into the existing one currently under practice by MARAD.

Honduras is a maritime nation. Unfortunately this condition has not been properly exploited by the Honduran people. In order to maximize the benefits from the sea, Honduras as a country needs to first establish a sound and thorough educational program. This program should cover all aspects of maritime education, from administration to engineering.

Our people need to understand what type of resources do exist first and then to learn the procedure to exploit them efficiently and with maximum results. Without the proper education, this could never be achieved.

Since there are no Maritime Education and Training Institutions in Honduras at the present, this paper concentrates on a small contribution from the Navy to start the educational program. Although the Naval Technical School is an educational center that has served it's purpose succesfully, it's curricula is not designed for merchant mariners training.

The idea of this project is to merge the current curricula of the School into one that will include training for merchant mariners.

This is only a small portion of what needs to be done. As the necessity arises, this condition of a maritime nation that has remained dormant for so long has to be awakened for the benefit of all Hondurans.

As mentioned earlier, the only way to accomplish this is through education. Education is the key for success. The maritime field is a ripe area in Honduras for development. A sound educational program in the maritime sector should bring success to our country in the economic and social aspects. If this point is emphasized to our people and the proper educational program gets implemented, time will prove the correctness of this issue.

Finally, I would like to refer to an old Chinese proverb that I think applies in all aspects of life, and especially here:

"In order to feed the people, you have to teach them how to catch fish, rather than giving them fish".

ANNEX 1

Education/Training Program Elements and Nominal Hours for Engineer Officer in Charge of the Watch.

EDUCATION/TRAINING PROGRAMME ELEMENTS	STCW REFERENCE	NOMINAL HOURS
ENGINEERING WORKSHOP TECHNOLOGY		
Engineering workshop craft skills	Regulation III/4	390
THEORETICAL STUDIES		
Engineering and Scientific Principles Laboratory Support Programme	Regulation III/4	690
SEA TRAINING		
Operational Practices and Procedures Watchkeeping Practices and Procedures	Regulation III/4 Regulation III/1 and Res. 2 and 4	900 240 (min.)
PROFESSIONAL MARINE ENGINEERING STUDIES		
Engineering Design Factors) Ship and Machinery Constructional Details) Ship and Machinery Operational Practices)	Regulation III/4	600
SPECIALIZED TRAINING		
Fire-fighting Aboard Ship First Aid at Sea Sea Survival Damage Control Tanker Safety (if required) Others (according to ship type and/or duties aboard ship)	Regulation III/4 Regulation III/4 Resolution 19 Regulation III/4 Regulation V, 1, 2 and 3	15 and 30 15 15 15 Variable according to level
		3420

ANNEX 2

Education/Training Program Elements and Nominal Hours for Second Engineer Officer.

EDUCATION/TRAINING PROGRAMME ELEMENTS	STCW REFERENCE	NOMINAL HOURS
MARINE MACHINERY MAINTENANCE TECHNOLOGY Techniques and Practices for: Condition Monitoring) Diagnostic Testing) Regulation III/2 Predictive Maintenance) Preventative Maintenance)	Regulation III/2	120
THEORETICAL STUDIES Engineering and Scientific Principles) Regulation III/2 Laboratory Support Programme)	Regulation III/2	240
PROFESSIONAL MARINE ENGINEERING STUDIES Marine Engineering Plant Design Factors) Marine Machinery Operational Practices) Regulation III/2	Regulation III/2	270
SPECIALIZED TRAINING Basic Management Studies Ship Safety, Damage Control Others (as required, or necessary)	Regulation III/2 Regulation III/2	60 30
		720

ANNEX 3

Education/Training Program Elements and Nominal Hours for Chief Engineer Officer.

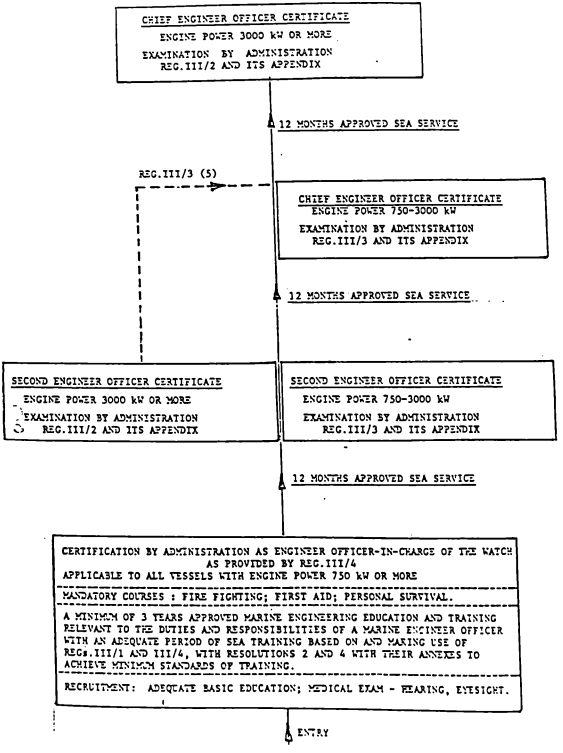
EDUCATION/TRAINING PROGRAMME ELEMENTS	STCW REFERENCE	NOMINAL HOURS
THEORETICAL STUDIES Engineering and Scientific Principles) Laboratory Support Programme)	Regulation III/2	300
PROFESSIONAL MARINE ENGINEERING STUDIES Marine Engineering Plant Design Factors) Marine Machinery, Optimum Performance)	Regulation III/2	300
SPECIALIZED TRAINING Technical/Engineering Management Studies) Finance Management Studies) Human Relations) National/International Maritime) Requirements) Others [as required, or necessary])	Regulation III/2	120
		720

ANNEX 4

Certificates Required with Respect to Ship Power.

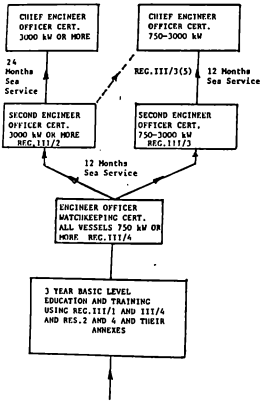
POWER LIMIT	CERTIFICATE REQUIRED	RELEVANT REGULATION IN IMO STCW 1978
3000 KW OR MORE	CHIEF ENGINEER OFFICER	III/2 + APPENDIX (Not 2 (b) (i))
	SECOND ENGINEER* OFFICER	III/2 + APPENDIX (Not 2 (b) (ii))
750 - 3000 KW	CHIEF ENGINEER OFFICER	III/3 + APPENDIX (Not 2 (b) (i))
	SECOND ENGINEER OFFICER	III/3 + APPENDIX (Not 2 (b) (ii))
750 KW OR MORE	ENGINEER OFFICER IN CHARGE OF A WATCH	III/4 (CERTIFICATION) III/1 + RESOLUTION 2 & 4 AND ANNEXES IN RESPECT OF WATCHKEEPING
NONE	RATING FORMING PART OF A WATCH (NO CERTIFICATE ISSUED)	III/6 (MANDATORY) (REQUIREMENTS) ALSO, RESOLUTION 9 + ANNEX

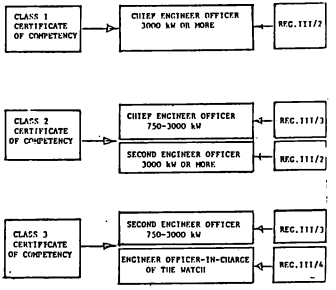
Marine Engineer Officer Pathline with Respect to STCW.



ANNEX 6

Suggested Structure for Engineer Officer Certification in Terms of STCW.

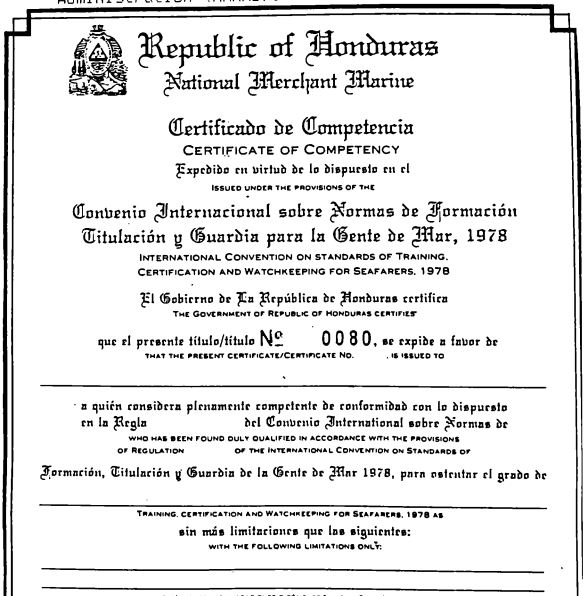




THE CERTIFICATE STRUCTURE IS KEPT SIMPLE BY ALLOWING ONE CERTIFICATE TO COVER MORE THAN ONE ENGINEER OFFICER FUNCTION ABOARD SHIP.

THE AUTHORITY WOULD HAVE TO ENDORSE THE CERTIFICATE TO THE EFFECT THAT THE OFFICER HAD BEEN PROPERLY EXAMINED AND FOUND COMPETENT TO CARRY OUT THE DUTIES AND RESPONSIBILITIES RELEVANT TO THE POST/RANK ABOARD SHIP AS SPECIFIED BY THE IMO STCW 1978 CONVENTION.

Certificate of Competency, Honduran Maritime Administration (MARAD).



Republic of Honduras
National Merchant Marine

Certificado de Competencia
CERTIFICATE OF COMPETENCY

Expedido en virtud de lo dispuesto en el
ISSUED UNDER THE PROVISIONS OF THE

Convenio Internacional sobre Normas de Formación Titulación y Guardia para la Gente de Mar, 1978
INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978

El Gobierno de La República de Honduras certifica
THE GOVERNMENT OF REPUBLIC OF HONDURAS CERTIFIES

que el presente título/título Nº 0080, se expide a favor de
THAT THE PRESENT CERTIFICATE/CERTIFICATE NO. , IS ISSUED TO

a quién considera plenamente competente de conformidad con lo dispuesto en la Regla del Convenio Internacional sobre Normas de
WHO HAS BEEN FOUND DULY QUALIFIED IN ACCORDANCE WITH THE PROVISIONS OF REGULATION OF THE INTERNATIONAL CONVENTION ON STANDARDS OF

Formación, Titulación y Guardia de la Gente de Mar 1978, para ostentar el grado de
TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978 AS

sin más limitaciones que las siguientes:
WITH THE FOLLOWING LIMITATIONS ONLY:

INDÍQUENSE LAS LIMITACIONES O PÓNGASE "NINGUNA", SEGÚN PROCEDA
INSERT HERE LIMITATIONS OR "NONE" AS APPROPRIATE

FOTO
Y
SELLO OFICIAL

Fecha de expedición del presente refrendo:
DATE OF ISSUE OF THIS ENDORSEMENT:

Fecha de vencimiento:
EXPIRATION DATE:

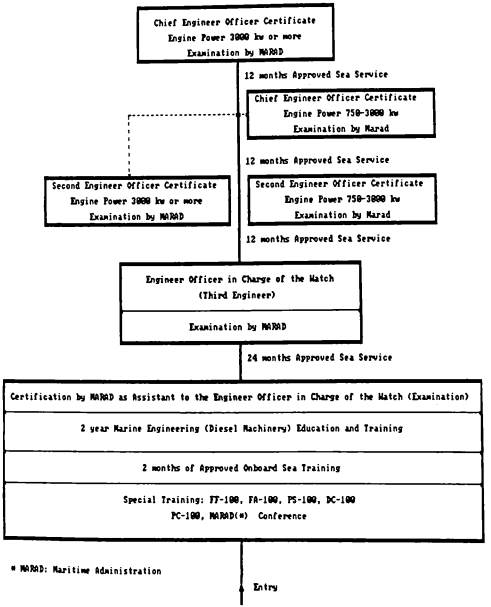
Firmado
SIGNED (NOMBRE Y FIRMA DEL OFICIAL DEBIDAMENTE AUTORIZADO / NAME AND SIGNATURE OF DULY AUTHORIZED OFFICIAL)

Fecha de nacimiento:
DATE OF BIRTH: DEL TITULAR / OF THE HOLDER OF THE CERTIFICATE

Firma:
SIGNATURE DEL TITULAR / OF THE HOLDER OF THE CERTIFICATE

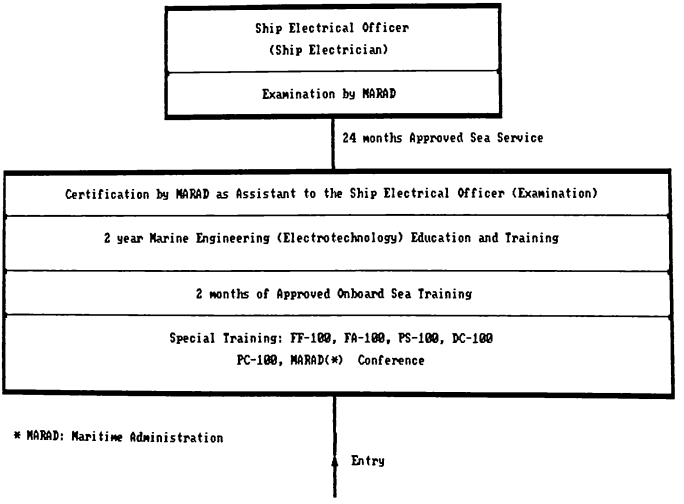
ANNEX B

Certification Pathline for the Naval Technical School Graduate (Marine Engineer).



ANNEX 9

Certification Pathline for the Naval Technical School Graduate (Ship Electrician).



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