MARITIME (MAR)

MAR 1113 Fabrication and Repair I (3-1-3)
Introduction to workshop practices and the use of machine tools as relevant to seagoing marine engineers. Provides basic quality control checks of finished products. Material includes health, safety and environment regulations, and proper use of fabrication tools and regular logbook maintenance skills.

MAR 1122 Introduction to Marine Engineering (2-1-2)
Introduction to marine engineering, designed for students undertaking the bachelor of Applied Science, Marine Engineering Program. Include basic information on marine engineering and the relevant rules and regulations governing maritime operations, including classification societies and IMO.

MAR 1132 Marine Chemistry (2-1-2)
Introduction to marine chemistry. Covers the properties of matter in terms of fundamental principles and provides the understanding of chemical energy concepts. Introduce gas law and kinetic theory of gases, spontaneity of reaction, chemical equilibrium, properties of solutions, and study the phenomena of liquid at interface. Focus on applications of particular interest to the marine environment.

MAR 1210 Marine Engineering Seatime I (0-10-10)
Undertaken under the supervision of a senior officer while the student is at sea. A detailed record of tasks and duties performed under the direction of ships officers will be kept in a training record book, dated and signed by the supervising officers. This Training Record Book (TRB) together with a number of project work and assignments will be assessed for completion by HCT staff at the end of the semester. The material will include: use of hand tools; watchkeeping; electrical systems; auxiliary equipment; and maintenance.
Prerequisites: MTR 1003, MAR 1113, MAR 1122

MAR 2203 Naval Architecture (3-1-3)
Introduce the maritime profession, including basic information on ship design/categorization, the ship building, designing and operating professions, an introduction to the rules and regulations governing maritime operations, including classification societies and IMO. An introduction to principal features of ships, including lines drawing. Covers hydrostatics, intact stability, small angle stability, cross curves and large angle stability. Free surface, list and loll angles, and trim. The concept of the trim and stability booklet is introduced, and its application explained.
Prerequisites: MTH 2103, MCE 2203, MCE 2223, MCE 3403

MAR 2303 Mathematics for Marine Engineering (3-1-3)
Covers mathematical skills essential for progression to the study of calculus and further engineering mathematics. Includes polynomials, linear algebra, vectors, complex numbers, exponential and logarithmic functions, variation and inequalities.

MAR 2313 Marine Engineering Knowledge (3-1-3)
Introduction to the theories and principles of a very wide range of marine engineering equipment, including: main engines (different types); auxiliary engines; marine boilers; shafts; seals; tanks (fresh water, ballast, and cargo); valves; air conditioning equipment; refrigeration equipment; pumps (different types); steering gear; stabilizers; and scrubbers.

MAR 2403 Fluid Mechanics for Marine Engineering (3-1-3)
Covers the basic concepts of fluid mechanics. Emphasis will be placed on basic topics including fluid properties, hydrostatics and hydrodynamics (buoyancy, forces on submerged surfaces, pipe flow and energy losses). The course practical work will reinforce the theory through a set of experiments in the hydraulics laboratory.

MAR 2413 Applied Marine Mechanics I (3-1-3)
This course introduces the fundamentals of statics for particles and rigid bodies and covers the principles of dynamics with engineering applications.

MAR 2423 Ship Stability (3-1-3)
Covers the basic stability of ships to enable seagoing officers to understand issues associated with loading, unloading and moving of cargo and related aspects. Includes transverse stability (small angle and large angle), free surface effects, list and loll angles, and trim. Introduce the concept of the trim and stability booklet, and its application.
Prerequisites: MAR 2303

MAR 2433 Fabrication and Repair II (3-1-3)
Builds upon the fabrication and repair course in first semester, together with the experience that the cadets will have obtained during their first period of seatime. It covers more advanced fabrication techniques, including the construction of a more elaborate example piece. Health and safety issues continue to be emphasized.
Prerequisites: MAR 1113, MAR 1210

MAR 2442 Marine Material Technology I (2-1-2)
Introduction to the wide range of materials used in the maritime environment. It covers: mild steel; stainless steel; aluminium; concrete; wood; and glass reinforced plastic. The particular issues with each of these for the maritime environment are discussed, and applications for each included. In addition, the particular properties of the wide range of different mild steels is discussed in detail.
Prerequisites: MAR 1113, MAR 1132

MAR 3103 Marine Machinery Systems (3-1-3)
Introduces machinery systems used on ships, both for main propulsion and auxiliary/hotel loads. Includes low speed diesels; medium speed diesels; steam turbines; gas turbines; boilers; electric propulsion; podded propulsion; bow thrusters; controllable pitch propulsion; scrubbers; pumping and piping; electricity generation; fuel supply; rudders and steering gear; cranes and other deck machinery; and automation issues.
Prerequisites: MAR 2203

MAR 3202 Ship Production (2-1-2)
Covers the overall philosophy and techniques for the manufacture of ships, including materials, welding, and cutting, shipyard practice and shipyard layout, with the differences between approaches for different ship sizes and types covered.
Prerequisites: MCE 2323, MAR 2203

MAR 3303 Resistance and Propulsion (3-1-3)
Covers an introduction to the resistance and propulsion of surface ships. It includes: components of resistance; Froude's law of similitude; the principles associated with model testing for resistance prediction; systematic series; ship-propeller interaction and an introduction to the use of Computational Fluid Dynamics, as applied to ship resistance prediction. Cover the concepts associated with the design of a ship's propeller including the principal features of propellers; the use of systematic series; and cavitation.
Prerequisites: MAR 2203, MTH 3013

MAR 3402 Ship Structures I (2-1-2)
Introduces rationally based structural design and optimization for ships. Loading and responses in ship structures. Bending of the hull girder, and hull girder response. Application of beam theory to typical ship types, including those with open decks. Fatigue and fracture of ship structures, including an introduction to fracture mechanics.
Prerequisites: MCE 2203, MTH 2503, MCE 2223, MCE 2213, MCE 2311

MAR 3503 Design of Ships and Maritime Structures (3-1-3)
Introduces the fundamental aspects of the rational engineering approach to, and issues which influence, the design of ships and maritime structures. CAD skills as applied to ship design, including specific commercial modelling software are introduced.
Prerequisites: MAR 3103, MAR 2203, MCE 2203, MCE 2223, MCE 2213, MCE 2403, MCE 2311

MAR 3510 Marine Engineering Seatime II (0-10-10)
Conducted at sea, and will be supervised by a senior officer on board. A detailed record of tasks and duties performed under the direction of ships officers will be kept in a training record book, dated and signed by the supervising officers. This Training Record Book together with a number of project work and assignments will be assessed for completion. Includes watchkeeping; practical engineering knowledge; electrical systems; maintenance; and practical control engineering. Meets the requirements of the STCW Convention for shipboard training of deck officer trainees.
Prerequisites: EMC 3013, MAR 1210, MAR 2433, MAR 2313

MAR 3603 Applied Marine Mechanics II (3-1-3)
Introduction to the concepts and principles of naval architecture and ship construction. It covers practical aspects of ship design, including the purpose and names of important elements of a ship. Different ship types, the reasons for these and their principal design differences are covered. These include: general cargo vessels; dry bulk carriers; oil tankers; gas carriers; containerships; cruise ships; passenger ships; ferries; tugs; supply boats, other support vessels; and warships.

MAR 3613 Ship Construction (3-1-3)
Introduction to the concepts and principles of naval architecture and ship construction. It covers practical aspects of ship design, including the purpose and names of important elements of a ship. Different ship types, the reasons for these and their principal design differences are covered. These include: general cargo vessels; dry bulk carriers; oil tankers; gas carriers; containerships; cruise ships; passenger ships; ferries; tugs; supply boats, other support vessels; and warships.

MAR 3623 Marine Engineering Control I (3-1-3)
Introduction to the basic applications of automatic control theory and the use of these concepts in a wide variety of different marine applications. Different concepts of control theory are considered, and their applications on board ships discussed. Typical control hardware is studied, and examples given.

MAR 3633 Marine Electrical Systems I (3-1-3)
Introduction to the fundamentals of common electrical machines used in maritime environments. The physical concepts and basic laws governing electrical machine operation are introduced, and the principles underlying the performance of electrical machines are explained. In addition, the course covers power transformation and transmission in ships. A number of shipboard applications are given.
Prerequisites: MAR 2313

MAR 3643 Diesel Engine Maintenance (3-1-3)
Comprehensive introduction to the maintenance of diesel engines in the maritime environment. Typical large low speed two stroke diesel engines are included, as well as smaller high and medium speed diesel engines. In addition to routine maintenance, troubleshooting issues are included.

MAR 4223 Marine Engineering Control II (3-1-3)
Builds on the previous control course and extends the knowledge of control theory and its application in the marine environment in a practical manner. In addition, specialist areas of control relevant to different pieces of shipboard equipment are considered, and the range of relevant control strategies examined.

MAR 4423 Coastal Engineering and Maritime Structures (3-1-3)
Includes an introduction to the study of processes ongoing at the shoreline and within the coastal zone. Longshore and cross-shore currents are covered, including their effect on sand transport and beach erosion. Covers the design of typical maritime coastal structures, including: breakwaters; groins; jetties; and sea walls.
Prerequisites: MAR 2203, MAR 4833

MAR 4433 Offshore Engineering (3-1-3)
Introduces offshore engineering, including the design of offshore platforms for oil and gas exploration and production. Includes an introduction to subsea engineering, including subsea completions and pipelines on the seabed.
Prerequisites: MAR 2203, MAR 3402, MAR 3503, MAR 4833

MAR 4443 Ship Production II (3-1-3)
Covers advanced ship production techniques, following on from MAR 3202, Ship Production. It focusses on efficient shipyard layout and ship production techniques, making use of international best practice, as applied in the UAE context. Economic aspects of ship production, and shipyard practices are also included, as well as project management, as applied to ship production.
Prerequisites: MAR 2203, MAR 3202, MAR 3402, MAR 3503

MAR 4453 Ship Repair (3-1-3)
Focuses on ship repair techniques, including regular maintenance, following on from MAR 3203, Ship Production. Ashore and afloat techniques are included, and issues associated with both are discussed in detail. Project management techniques used for ship repair are also covered.
Prerequisites: MAR 2203, MAR 3202, MAR 3402, MAR 3503

MAR 4463 Port Engineering (3-1-3)
Covers the planning and engineering of ports and harbours. Ship berthing and manoeuvring aspects are covered, including the need for, and the design of, navigation aids. Engineering issues associated with the design of different types of marine terminals (container, dry bulk, and liquid bulk, including gas) are included.
Prerequisites: MCE 2213, MAR 2203, EGN 3012

MAR 4710 Marine Engineering Seatime III (0-10-10)
Includes a detailed record of tasks and duties performed under the direction of ships officers will be kept in a training record book, dated and signed by the supervising officers. This Training Record Book together with a number of project work and assignments will be assessed. Includes marine machinery operations; practical engineering knowledge; maintenance; watchkeeping and practical control engineering. Meets the requirements of the STCW Convention for shipboard training of marine engineering officer trainees.
Prerequisites: MAR 3510

MAR 4803 Ship Structures II (3-1-3)
Introduces theories and concepts to describe and analyse the dynamic response of ship structures. Apply analytical models to the design of ship structures, and explore the use of simple and advanced methods to obtain internal forces and displacements, as well as buckling loads. Covers statistical predictions of wave-induced loads and hull girder response. Includes load cases prescribed by Classification Societies, and the application of Classification Society rules to ship structures.
Prerequisites: MAR 3402

MAR 4804 Engineering Knowledge - Diesel (4-1-4)
Covers the theory, design, operation and maintenance of marine diesel engines. Two and four stroke diesels are included, as are low speed, medium speed and high speed. Applications of each of these are given, along with the pros and cons of each. In addition, recent developments in diesel engines are covered. Dual fuel diesel/gas engines, and gas engines are also included.
Prerequisites: MAR 2313

MAR 4805 Maritime Design Project I (5-1-5)
Covers the knowledge and capabilities developed during the previous years on the program, as applied to the design of a ship and associated machinery systems.
Prerequisites: MAR 2203, MAR 3103, MAR 3202, MAR 3402, MAR 3503, EGN 3012, EGN 3212

MAR 4814 Engineering Knowledge - Steam (4-1-4)
Covers the theory, design, operation and maintenance of marine diesel engines. Two and four stroke diesels are included, as are low speed, medium speed and high speed. Applications of each of these are given, along with the pros and cons of each. In addition, recent developments in diesel engines are covered. Dual fuel diesel/gas engines, and gas engines are also included.
Prerequisites: MAR 2313

MAR 4823 Marine Airconditioning and Refrigeration (3-1-3)
Introduction to air conditioning systems and refrigeration systems on board ships. The principles and theory of operation of typical equipment is covered. This includes equipment for hotel services as well as for cargo, such as refrigerated cargo, and refrigerated containers. Examples of applications of various types of equipment are given.
Prerequisites: MAR 2313

MAR 4833 Seakeeping and Manoeuvring (3-1-3)
Covers an introduction to ocean waves; the prediction of ship motions in regular waves (both experimentally and numerically); statistical approaches to assessing the motions of a ship in a seaway, motions criteria, and introduction to ship manoeuvring in open and in restricted water, including the concepts of ship-ship interaction.
Prerequisites: MAR 2203, MAR 3503, MTH 2503, MTH 1113

MAR 4843 Marine Electrical Systems II (3-1-3)
Introduction to the various electrical systems that are on board ships. It includes an introduction to a variety of bridge equipment such as: electronic navigational aids; sonar; meteorological equipment and instrumentation. Electrical cargo handling equipment, including: cranes; pumps; lifts; and ramps are covered. Electrical equipment in the accommodation and engine room are also included.

MAR 4853 Marine Surveying (3-1-3)
Covers introduction to the principles of ship and engine surveying, as required by a marine surveyor, issues associated with surveying for new build and/or repair in a shipyard and those associated with ongoing surveys, and port state control.
Prerequisites: MAR 3402

MAR 4865 Maritime Design Project II (5-1-5)
Covers the knowledge and capabilities developed during the previous years on the program, as applied to the design of a ship and associated machinery systems.
Prerequisites: MAR 4805, MAR 4833

MAR 4883 Maritime Transportation (3-1-3)
Introduces to the economic principles of commercial shipping practice. Includes the basics associated with ship ownership, ship chartering, and commercial ship operation. Covers the principles of international trade, international commerce, the key trade routes, and the role of shipping in an integrated multi-modal supply chain.
Prerequisites: EGN 3212

MAR 4903 Marine Safety (3-1-3)
Covers the issues associated with marine safety, including the concepts of risk management, designing for safety, maritime safety regulations, and classifications societies. Discuss case studies based on maritime accidents, and their subsequent effect on maritime regulations and accident investigation procedures are also covered.
Prerequisites: MAR 2203, MAR 3503

MAR 5005 Leadership for Chief Engineers (5-1-5)
Prepare students for the position as Chief Engineer. The requirements of a chief engineer are covered, along with various leadership strategies to best meet the challenges of leading a diverse group of officers and crew on a ship. In addition, the differences between shipboard command and senior leadership positions ashore are discussed. In addition to routine operations, the leadership skills and techniques to be employed in a variety of on board emergency situations are covered.

MAR 5014 Marine Machinery Operations (4-1-4)
Capstone course which covers all operations of the wide range of marine machinery used on board ships from the view point of a chief engineer. It includes all the processes from start up to shut down, both in routine operations and under emergency conditions. Troubleshooting and other unusual operational scenarios are included.

MAR 5024 Advanced Ship Regulation and Survey (4-1-4)
Covers regulations concerning the construction of passenger ships, cargo ships and barges. Conduct a ship survey with effectiveness and efficiency. Essential law, safety and operational surveys, incident and accident investigation along with writing the survey report and flag and port state control inspections.

MAR 5903 Marine Material Technology II (3-1-3)
Covers the theory of marine materials in a greater depth. In particular, mild steel, and the various classifications of this are dealt with. Theoretical considerations of other materials used on board ships are also covered, including: high strength steel; stainless steel; aluminium; and fibreglass. The compatibility of different materials is covered, both from a point of view of corrosion and also from load bearing considerations.

MAR 5914 Ship Design and Technology (4-1-4)
Covers a range of technical topics, building on knowledge gained earlier in the program, associated with the design and construction of different vessel types, including: general cargo vessels; dry bulk carriers; oil tankers; gas carriers; containerships; cruise ships; passenger ships; ferries; tugs; supply boats; other support vessels; and warships.

MAR 5924 Advanced Marine Engineering Knowledge (4-1-4)
Advanced course on marine engineering application and knowledge, which brings together all the earlier courses. This is covered in a capstone manner as required for the chief engineer on board a ship who needs to have a thorough understanding of all equipment and structure on the ship, and their interaction, both in routine situations and in emergencies. An introduction to project management is also included.

MAR 5934 Marine Engineering Project (4-1-4)
First of two linked project based final year courses. An appropriate project will be chosen by the student with guidance from relevant faculty members. Conducting the project will integrate many of the skills and knowledge obtained during the program, as well as develop independent learning. Students are expected to submit, and defend, their project in the presence of faculty members, and their peers.
Prerequisites: MAR 4710