LLOYD'S MARITIME ACADEMY

DIPLOMA IN MARINE ENGINEERING

STUDY KEY PRINCIPLES ASSOCIATED WITH MARINE ENGINEERING, SHIP SYSTEMS AND ENGINEERING PRACTICE, PLUS RELATED LEGISLATION AND OPERATING PRACTICES

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Tutored and Awarded by

NKC NORTH KENT COLLEGE

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ABOUT THIS COURSE

The diploma in Marine Engineering combines knowledge of technological developments together with an understanding of the relevant industrial legislation and safe operating practices needed for today's marine engineer.

It is the ideal programme for those needing to develop a good knowledge of marine engineering principles and practices, or looking to continue their professional development in marine engineering beyond a vessel based role. This Diploma will provide the necessary underpinning knowledge and understanding to facilitate such a move.

Group bookings may qualify for a discounted enrolment fee.

Click here to find out more.

COURSE HIGHLIGHTS

Delivered by experts in the field – Course Director: **Paul Russell**

Duration: **52 weeks**

Delivery: **Online**

Award: **Diploma (Lloyd's Professional Development)**

KEY INFORMATION

When does it start and how long is the course?
The course is 12 months long and the modules are released online, one every month. Please go online to see the next available start date.

What are the entry requirements?
Participants should be able to prove a minimum achievement of A-Level or equivalent (High School) or those who demonstrate a number of years of relevant industry experience are welcome to apply. You must have an adequate command of English in order to meet the demands of the course.

How is the course assessed?
The course is assessed through a mixture of written coursework and online tests. Written assignments are submitted online and written feedback is provided by the marker.

How much does it cost?
Please go online to www.lloydsmaritimeacademy.com/dme and see the Fees page for full details.
An interest-free instalment plan is available.
Please contact us for more details.

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IDEAL FOR

This programme is very popular for wider maritime industry professionals seeking to further their technical know-how or build their awareness of key scientific theories and mechanical principles used by marine engineers across the maritime sector.

- ✓ Naval architects, design coordinators, purchasing professionals, sales managers and logistics personnel
- ✓ Marine surveyors, fleet or vessel superintendents and HSSE personnel needing to develop their engineering knowledge
- ✓ Project managers, coordinators and production supervisors involved in vessel design, build, modification, repair or scrapping
- ✓ Insurance and claims executives plus legal and financial professionals working in the maritime sector
- ✓ Seagoing marine engineers wishing to develop and widen their professional seagoing knowledge
- ✓ Maritime professionals needing to develop technical understanding of engineering theories and mechanical principles

WHAT YOU WILL LEARN

At the end of the course, participants will be able to:

- ✓ The marine engineers required knowledge of associated international laws and conventions
- ✓ The science behind the practice of marine engineering
- ✓ Ship design principles, operations, maintenance and surveys
- ✓ Propulsion designs and future developments
- ✓ Power generation and thermodynamics
- ✓ Auxiliary and ancillary machinery systems and layout
- ✓ The marine engineer's awareness of operating in a safe and efficient manner
- ✓ Consideration for and the legal requirements covering the environment
- ✓ Undertake a vessel design specification combining the necessary legislation, structural and engineering considerations

> "The course was interesting, inspiring and beneficial"

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LLOYD'S MARITIME ACADEMY

COURSE DIRECTOR

Paul Russell MSc, BA (Hons), MIMarEST - Managing Director and Founder (Thamesview Maritime Limited)

Paul completed a traditional engineering cadetship with Cunard Shipping Services and, during his sea-going career as an engineer, he served on all types of ships from passenger ships to supertankers. His sea service included medium speed engines powering small tankers, through to slow speed engines driving bulk carriers and to steam plant providing the power for container ships. Later Paul served as an assistant superintendent during the building of RoRo vessels for Cunard at Swan Hunter's shipyard on the River Tyne.

Paul then moved into education and worked with the National Sea Training Trust to introduce marine engineering education and training into the college at Gravesend and also completed a Masters Degree in Educational Management at the University of Greenwich. In 1996 Paul was appointed as Head of the National Sea Training Centre at North Kent College, where he also undertook the role of Course Director for the Diploma in Marine Surveying delivered in a partnership with Lloyd's Maritime Academy.

In 2010 Paul started a maritime consultancy business dedicated to the professional development of seafarers and engagements including marine propulsion and auxiliary machinery; change management process and strategic direction for a marine charity; modernising two marine engineering books; supervising undergraduate and postgraduate students and developing the business plan for a new marine training and conference complex.

HOW YOU WILL LEARN

Every course is broken down into manageable modules, designed to accelerate your learning process through diverse learning activities:

- ✓ Work through your instructional material online
- ✓ Interact with your peers and learning facilitators through the online forum to discuss subject related issues and to network with your fellow learners
- ✓ Investigate relevant, real-world case studies
- ✓ Apply what you learn each week to ongoing project submissions

SYLLABUS

LLOYD'S MARITIME ACADEMY

MODULE 1

Marine Engineering in Context: Maritime Transport; Ships and Machinery

This module introduces the topic of marine engineering, with a global and historical context. Students will also learn about the role of Marine Engineers and various legislation they must adhere to.

In this module, participants will also learn about:

- Marine transport – brief recent history, background and key players
- The role of the marine engineer
- Efficient shipping – technical and economic factors
- Economic environment of the maritime industry
- Transportation
  - Role of shipping as an element of transportation chain
  - Supply and demand in maritime industry
  - Trend in global and regional cargo flow
- Introduction to offshore industry
  - Application and development of subsea systems
- Regulatory framework of maritime operations
  - The role of classification societies
  - Flag & port state
  - IMO's technical responsibilities
  - NGO's advising IMO
  - Marine Regulatory bodies, their roles and associated conventions
  - Design and construction, in service inspection and surveying and ISO standards

MODULE 2

An Introduction to the Science that Supports Marine Engineering Practice

Module two gives an in-depth explanation of the science behind marine engineering. Throughout the module, students will be given examples of the formulas and how to apply them, in their future role as an engineer. In this module, participants will learn about:

- Mathematics: A brief overview with examples showing the reasons for studying this subject
  - Numerical evaluation of expressions
  - Simplification of algebraic expression
  - Changing the subject of formula

MODULE 2 CONTINUED

  - Solving equations
  - Using indices, and exponential and logarithmic functions
  - Using scientific /engineering notation
  - Differential and integral calculus
  - Trigonometric functions and graphs
- Dynamics and machines
  - Displacement, velocity, speed and acceleration for angular motion
  - Relationship between linear and angular motion
  - Motion of projectiles
  - Force, mass and acceleration
  - Momentum
  - Newton's laws of motion
  - Work and energy
  - Power, force and velocity
  - Torque
- Modelling, control and simulation of hydraulic and electric systems
- Fundamentals of control theory, elements and signals
- Introduction to forces acting on a ship at sea
- Forces and moments concerned with static equilibrium and framed structures
  - Compressive/tensile loading and bending of sections
  - Sections under shear and shafts under torsion
  - Fluids at rest, hydrostatics – example manometers
  - Hydrodynamics
- Statics and strength of materials
  - Vector and scalar quantities
  - Equilibrium, resultant and equilibrant
  - Moment of a force
  - Principle of moments
  - Conditions of equilibrium for non-concurrent coplanar force systems
  - Concurrency of three non-parallel coplanar forces for equilibrium
  - Resolution of forces
  - Stable, unstable and neutral equilibrium
  - Pin joints
  - Bows Notation
  - Reaction forces
  - Strut and tie
  - Magnitude and nature of a force

SYLLABUS CONTINUED

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MODULE 3

Naval Architecture: Hydrostatics, Stability and Ship Design

Building on the previous module, students will look at stability, how it can be calculated and how it can be ensured through good ship design. Students will also learn about the various components of a ship which can influence stability, such as rudders, propellers and thrust.

In this module, participants will learn about:

- Hydrostatics
  - Buoyancy and displacement
  - Change in draught due to density
  - Wetted surface areas
  - Coefficients of form
  - Tonnes per centimetre immersion (TPC)
  - Simpson's Rule
- Stability
  - Centres of gravity: vertical and longitudinal
  - Effect of bilging a mid-ship compartment
  - Small and large angle stability
  - Angle of list
  - Inclining experiment
  - Rudders
- Propellers and resistance
  - Components of ship resistance
  - Admiralty coefficient
  - Fuel coefficient
  - Propeller calculation: propeller terminology, thrust calculation, slip
- Ship design
  - Design optimisation
- Offshore facilities

MODULE 4

Power Generation and Control: Electrotechnology, electronics and control engineering

This module looks at electronics and how marine engineers must incorporate these systems in to their ship design. Students will learn about small circuit/signal design, electrical components, as well as, higher voltage systems. Auxiliary electrical systems and components will also be discussed throughout the module.

In this module, participants will learn about:

- Principles of marine electrical systems
- Electrical and electronic devices
  - Physical construction and characteristics of electrical/ electronic components.
  - Linear D.C. and A.C. electrical circuits
- Introduction to electronic engineering
  - Semiconductor devices used in rectification and small signal circuit
  - Programmable logic controllers (PLC)
- Electrical motors and generators
  - Three-phase circuits
  - Magnetism and electromagnetic induction
  - Generators and motors
- Electrical distribution systems and transformers
- High voltage systems and electric propulsion
- Instrumentation and control – transducers and pneumatic systems
- Systems engineering and process control
- Role of the electrotechnology officer
- Auxiliary systems and equipment
  - Types, layout, operating principles and construction
- Explore the move towards double-hull tankers and how this has developed from a safety law standpoint

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SYLLABUS CONTINUED

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MODULE 5

Thermodynamics, Heat Engine Principles

This module provides a fundamental, practical understanding of thermodynamics in relation to marine engineering. Students will learn how to use these principles as an analytical tool in both ship design and operations, with numerous real-world examples throughout.

In this module, participants will learn about:

- Marine heat engine principles
- Heat energy, sensible heat, latent heat
  - Change of phase diagram for water
  - Resultant temperature when a solid is placed in a liquid at a different temperature
  - Resultant temperature when up to three liquids at different temperatures are mixed.
  - Coefficient of linear expansion and coefficient of cubical expansion
  - Heat transfer by conduction, convection, radiation
  - Heat transfer through a composite wall of no more than three flat layers in contact
  - Heat transfer from a flat surface
- Marine thermal fluids
  - Heat transfer using extended surfaces
  - Heat exchanger theory and performance
  - Jet theory
  - Fluid flow in rotodynamic machinery
  - Pipe flow
  - Fluid power and losses
- Marine thermodynamic principles
  - Heat transfer during compression and cooling
  - Engine thermodynamics
  - Combustion and emission

MODULE 6

Fuel and Marine Propulsion Design

Following the previous module on thermodynamics, Module Six continues to develop students' technical knowledge and provides a basic understanding of marine propulsion design. The module discusses numerous design aspects (such as boilers, combustion engines and gears), alongside fuel management and market rates.

In this module, participants will learn about:

- Brief history of marine engines
- Internal combustion, diesel engines and operational principles of 2 and 4-stroke engines
  - Engine types and classification
  - Preliminary design calculations
  - Balancing, noise and vibration
  - Engine test analysis
  - The current situation with the use of scrubbing technology
- Boilers
  - Marine boilers design and operating principles
  - Steam turbine design and operating principles
  - Boiler auxiliaries and related systems
- Transmission systems
- Gear design
- Marine fuels and oils
  - Production of marine fuels
  - Fuel economy
  - Fuel specifications
  - ECA areas and the technology required for compliance
  - Alternative energy sources: including hydrogen, fuel cells, solar, wind and hybrid technology
  - LNG as a fuel
  - Lubrication principles and oil types

SYLLABUS CONTINUED

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MODULE 7

Auxiliary and Ancillary Machinery

The aim of Module Seven is to introduce the different support machinery and equipment which may be found on board a vessel, which are necessary to it's safe operation and running.

In this module, participants will learn about:

- Pneumatics, pumps and hydraulic systems
- Refrigeration and cooling systems
- Ventilation and air conditioning
- Cargo preservation: gas liquefaction, air conditioning
- Bilge and ballast systems
- Ship stabilisation
- Load analysis
- Dynamic positioning
- Auxiliary power systems
- Fire fighting
- Ancillary/Auxiliary systems
- Types of pumps, valves & heat exchangers
  - Lubricating oil system
  - Fresh water cooling system
  - Sea water cooling systems
- Steering gear
- Ship services layout
- Compressed air systems
- Fresh water and sewage systems
- Pipe and instrument diagrams
  - Control valves
  - Process control systems and tuning

MODULE 8

Propulsion, Ship Operations and Future Developments

Module Eight focuses on "current best practice" and looks at the pressures that are being placed upon owners and operators, which are influencing their current decisions about new builds and upgrades. The module also looks at the latest legislation, which is due to impact the shipping industry.

In this module, participants will learn about:

- Marine propulsion plant and ancillary equipment
  - Machinery selection
  - Layout choices of marine propulsion plant
  - Operating principles of marine propulsion plant
  - Construction of marine propulsion plant
  - Boiler feed water densities
- Operational procedures, problems and maintenance of marine propulsion plant
- Types of marine propulsion plant
  - Starting and stopping plant
  - Fault recognition
  - Maintenance procedures
  - Introduction to "Mechatronics"
- Propellers and shafting
  - Propeller design and analysis
  - Wake adaptation and propeller inflow optimisation; vortex theory and lifting line technique
  - Unconventional propellers
  - Propeller engine matching and off design conditions
  - Propeller excited vibrations, propeller singing
- Optimisation of performance at sea
  - Wind forces and moments
  - Performance loss estimation
  - Ship resistance
  - Hull roughness and fouling
- Future developments in propulsion technology
  - Green Ship technology

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SYLLABUS CONTINUED

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MODULE 9

Maintenance and Survey

Building on Module Eight, this module examines another concern for marine engineers and ship owners: maintenance. The module also identifies the component parts and discusses the aspects of these parts that need to be considered in hull survey.

In this module, participants will learn about:

- Ship construction principles and techniques
- General ship's terms
  - Midship sections of ship types
  - Framing systems
  - Constructional details
  - Rudder types and construction
  - Anchor and cable arrangement
  - Materials
  - Sections
  - Methods of cutting and welding
  - Fabrication methods
  - Drainage and ventilation
- Construction of specialised ships
  - LPG / LNG carriers
  - Oil tankers
- Marine production facilities and processes
  - Build strategies, quality assurance and cost minimisation
- Maintenance, condition monitoring, systems reliability
  - The ship life cycle
  - Maintenance cost evaluation
  - Failure mode and effect analysis
  - Risk-based maintenance
  - Ship repair and disposal
- Marine surveys
  - Categories of survey
  - Role and responsibilities of surveyors

MODULE 10

Marine Engineering Practice, Safety and the Environment

Module Ten aims to give a broad overview of marine engineering practice, safety and the environment. The module also discusses exciting industry developments, together with an understanding of the relevant legislation and safe operating practices needed for today's marine engineers.

In this module, participants will learn about:

- Marine management
  - Interpreting and applying maritime legislation and safety management systems to shipboard operations
  - Personnel management
  - Management theory and system control methods
- Safety engineering and the environment
  - Health and Safety legislation covering employers and employees
  - Handling, storage and disposal of dangerous substances
  - Work equipment safety requirements
  - Risk assessment
- Scheduling and planning
- Engineering activities in business context
- Cost estimates and economic viability
- Contract fundamentals: reading and assessing implications
- Productivity and competitiveness
- Pipe and instrument diagrams
  - Control valves
  - Process control systems and tuning

MODULE 10

Case Study: Design a Ship from Basic Principles

Students will be given the option to choose between two ship types and routes and then they must explain the legislation involved, complete basic power calculations and work out the size of the vessel and then explain the machinery required, taking into account all the current legislation affecting the building of modern ships.

WHO WE ARE

LLOYD'S MARITIME ACADEMY

ABOUT LLOYD'S MARITIME ACADEMY

Lloyd's Maritime Academy was born from Lloyd's List.

Lloyd's Maritime Academy is the trusted brand for professional development, working with leading academic and industry bodies to provide accredited education and training where it is much needed.

We are stepping up investment in new learning management platforms, improved content and learner resources to enhance your experience and ensure maximum reward for the investment you make in your future.

We continue to research new topics to provide you with the qualifications needed for a successful career; supporting a safer, cleaner and more efficient shipping industry for decades to come.

We look forward to welcoming you onto one of our programmes.

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WHY TAKE A LLOYD'S MARITIME ACADEMY COURSE?

Accessible – 24/7 availability from wherever you have an internet connection

Flexible – take control of where, when, how and the rate at which you study

Professional – industry leading course directors and tutors

Quality – study the same course used by corporations for internal training

Network – with tutors and like-minded professionals from around the world. Use our online tutorial forum to ask questions and share knowledge

Save money – no additional travel or accommodation costs

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North Kent College is a major UK college based on the River Thames providing further and higher education in the south east of England.

The College caters for more than 4,500 students across two main campuses, with a wide variety of academic and vocational courses, as well as professional education and training via short courses, part-time study or distance learning. Full-time and part-time higher education programmes and foundation degrees are delivered via a partnership with the University of Greenwich.

The National Maritime Training Centre at North Kent College is widely recognised within the maritime industry for providing sector-specific training within high quality industry-standard facilities.

The College is committed to helping students to achieve their ambition – whether they wish to gain their first job, achieve high-level professional qualifications, change career or prepare for their next promotion.

The College takes pride in working in partnership with industry to provide the correct mix of knowledge and practical skills that are required to sustain the workforce.

North Kent College is a partner of Lloyd's Maritime Academy in delivering this course and manages assessment, quality assurance and the award of the professional development Diploma.

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