



Department of Naval Architecture and Marine Engineering

The department of Naval Architecture and Marine Engineering offers the following programs:

1. Graduate Diplomas

1.1 Professional Diploma in Ship Maintenance and Repair

The student must complete 24 credit hours including 3 credit hours for the project.

Compulsory courses: The student must pass the following courses with a total of 18 credit hours from course numbers (07 11 621, 07 11 641, 07 11 661, 07 11 662, 07 11 683, 07 11 691).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Diploma courses”

1.2 Specialized Graduate Diploma in Ship Design

The student must complete 30 credit hours including 3 credit hours for the project.

Compulsory courses: The student must pass 9 courses with a total of 21 credit hours with course numbers (07 11 621, 07 11 631, 07 11 641, 07 11 681, 07 11 683, 07 11 691, 07 11 622, 07 11 682, 07 11 692).

1.3 Specialized Graduate Diploma in Offshore Engineering

The student must complete 30 credit hours including 3 credit hours for the project.

Compulsory courses: The student must pass 9 courses with a total of 21 credit hours with course numbers (07 11 621, 07 11 631, 07 11 641, 07 11 683, 07 11 632, 07 11 691, 07 12 671, 07 12 672, 07 12 673).

2. Master Degrees

2.1 Master of Engineering in Marine Engineering

The student must complete 30 credit hours in the form of courses and an additional 3 credit hours in the form of a scientific report.

Compulsory courses: The student must pass five courses with a sum of 15 credit hours with course numbers (07 11 741, 07 11 742, 07 11 743, 07 11 721, 07 11 792).



Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

2.2 Master of Engineering in Offshore Engineering

The student must complete 30 credit hours in the form of courses and an additional 3 credit hours in the form of a scientific report.

Compulsory courses: The student must pass six courses with a sum of 18 credit hours with course numbers (07 12 773, 07 11 721, 07 11 731, 07 12 741, 07 12 772, 07 12 774).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

2.3 Master of Science in Naval Architecture and Marine Engineering

The student must complete 24 credit hours in the form of courses and an additional 8 credit hours in the form of a thesis.

Compulsory courses: The student must pass three courses with a sum of 9 credit hours with course numbers (07 11 721, 07 11 731, 07 11 741).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

3. Doctor of Philosophy- Ph.D. Degree

3.1 Doctor of Philosophy in Naval Architecture and Marine Engineering

The student must complete 18 credit hours in the form of courses and an additional 24 credit hours in the form of a dissertation.

The following courses, if not taken before for the master degree, must be taken in addition to Ph.D. level courses: (07 11 721, 07 11 731, 07 11 741).

The student must choose three courses from those specified as “Doctorate courses”. The student has the right to choose three courses from another major.



List of Diploma, Master and Ph.D. courses

No.	Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
1	07 11 621	Hydrodynamics of Marine Units	3	3	
2	07 11 622	Ship Motion	3	3	07 11 621
3	07 11 631	Marine Structural Analysis (a)	3	3	
4	07 11 632	Marine Structural Analysis (b)	3	3	07 11 631
5	07 11 633	Structural Design of Marine Units	3	3	07 11 631
6	07 11 641	Marine Power Plants	3	3	
7	07 11 661	Shipyards Fabrication Processes	3	3	
8	07 11 662	Ship Maintenance and Repair	3	3	
9	07 11 681	Ship Design	3	3	
10	07 11 682	Ship Outfitting	3	3	07 11 651
11	07 11 683	Computer Applications in the Marine Field	3	3	
12	07 11 691	Economics of Marine Systems	3	3	
13	07 11 692	Marine Statutory Regulations	3	3	
14	07 12 671	Environmental Loads on Marine Units	3	3	
15	07 12 672	Offshore Systems	3	3	
16	07 12 673	Dynamics of Offshore Structures	3	3	07 11 631 07 11 632
17	07 11 721	Advanced Marine Hydrodynamics (a)	3	3	
18	07 11 722	Advanced Marine Hydrodynamics (b)	3	3	07 11 721
19	07 11 731	Advanced Marine Structure Analysis (a)	3	3	
20	07 11 732	Advanced Marine Structure Analysis (b)	3	3	07 11 731
21	07 11 733	Marine Composite Materials	3	3	
22	07 11 741	Marine Power Plants Systems (a)	3	3	07 11 741
23	07 11 742	Marine Power Plants Systems (b)	3	3	
24	07 11 743	Application of Energy in Marine Fields			
25	07 11 751	Marine Utilization of Energy	3	3	
26	07 11 761	Ship Production Planning and Control	3	3	
27	07 11 762	Quality Assurance Planning in Shipbuilding	3	3	
28	07 11 763	Accuracy Control in Shipbuilding	3	3	



Faculty of Engineering
Alexandria University

Graduate Studies
Internal Bylaws 2011
Amended 2013

29	07 11 781	Design of Modern Ship Types	3	3	
30	07 11 782	Special Topics in Ship Design	3	3	07 11 781
31	07 11 783	Computer Applications in the Marine Field	3	3	
32	07 11 791	Ship Salvage Operations	3	3	
33	07 11 792	Marine Pollution: Prevention and Control	3	3	
34	07 12 771	Dynamics of Ocean Waves	3	3	
35	07 12 772	Response of Offshore Structures	3	3	
36	07 12 773	Marine Pipelines	3	3	
37	07 12 774	Underwater Technology	3	3	
38	07 11 823	Computational Fluid Dynamics in Ship Hydrodynamics	3	3	07 11 721 07 11 722
39	07 11 824	Hydrodynamics of Marine Propellers	3	3	07 11 721
40	07 11 831	Theory of Ship Structures	3	3	07 11 731
41	07 11 832	Marine Structural Reliability	3	3	07 11 731
42	07 11 833	Marine Structure Dynamics	3	3	07 11 731 07 11 732
43	07 11 834	Structural Optimization	3	3	07 11 731
44	07 11 835	Material Fracture Analysis	3	3	07 11 731
45	07 11 841	Advanced Automatic Control in the Marine field	3	3	07 11 741
46	07 11 842	Advanced Marine Engineering	3	3	07 11 741
47	07 12 871	Stochastic Analysis of Ocean Waves	3	3	07 11 721
48	07 11 601	Diploma Project in Ship Maintenance and Repair	3	Presentation	
49	07 11 602	Diploma Project in Ship Design	3	Presentation	
50	07 11 603	Diploma Project in Offshore Engineering	3	Presentation	
51	07 11 701	Master of Engineering Scientific Report in Marine Engineering	3	Defense	
52	07 12 701	Master of Engineering Scientific Report in Offshore Engineering	3	Defense	
53	07 11 705	Master of Science Thesis in Naval Architecture and Marine Engineering	8	Defense	
54	07 11 801	Ph.D. Dissertation in Naval Architecture and Marine Engineering	24	Defense	



Description of Courses for Graduate Programs (Diploma- Master- Doctor of Philosophy)

07 11 621 Hydrodynamics of Marine Units

The motion of a viscous fluid. Navier-Stokes equation. Boundary conditions. Boundary layer theory. Conformal mapping. Source-sink distribution techniques. Green's theorem. Damping and added mass. Hydrofoil theory. Theory of wave resistance.

07 11 622 Ship Motion

Uncoupled modes of motion. Irregular seaways. Motion in an irregular seaway. Coupled motions. Nonlinear rolling motion. Loads due motion. Motion stabilization. Model tests, full scale trials and scale effects. Seakeeping considerations in design.

07 11 631 Marine Structure Analysis (a)

Idealization of marine structures. Classical theorems of structural analysis. Matrix structural analysis: forces and displacement methods. Virtual work, real and complementary energy.

07 11 632 Marine Structure Analysis (b)

Finite element methods. Element coordinate systems. Numerical integration methods. Basic elements. Axisymmetric shells and solids. Plate bending elements. FEM modeling of marine structures.

07 11 633 Structural Design of Marine Units

Hull girder bending moments and stresses. Hull girder shear forces and stresses. Hull torsion loading and stresses. Hull girder deflections. Local strength problems. Classification societies requirements.

07 11 641 Marine Power Plants

Power cycles. Operating characteristics and limitation. Advanced marine steam and gas turbine power plants. Advanced diesel marine power plants. Combined cycles. Propulsion. Heat exchangers. Pumps and compressors.

07 11 661 Shipyard Fabrication Processes

Steel cutting processes. Forming of plates and sections. Welding technology. Fabrication distortion. Fabrication residual stresses. Assembly and erection. Fabrication tolerances. Fabrication of non-ferrous materials

07 11 662 Ship Maintenance and Repair

Hull girder inspection and maintenance. Ship corrosion problems. Cathodic protection.



Surface preparation. Ship painting technology. The economics of ship maintenance. Classification societies requirements. Ship structural requirements. Design for inspection and maintenance. Technology of ship repairing. Non-destructive testing.

07 11 681 Ship Design

The concepts and requirements of ship design. Tendering and specifications. Detail design. Optimization problems in ship design. Computer software for ship design. Special craft. Unitization and containerization.

07 11 682 Ship Outfitting

Design and classification societies requirements. Deck equipment and machinery. Anchoring arrangements. Cargo hatch covers. Derricks and cranes. Steering gears and rudders. Mooring arrangements. Hull piping system. Ventilation. Insulation. Safety equipment.

07 11 683 Computer Applications in the Marine Field

Applications in marine field – Tutorials – CAD/CAM systems – Typical software packages for marine field- Project.

07 11 691 Economics of Marine Systems

Review of engineering economics. Shipbuilding cost estimation. Economics of ship operation. Feasibility analysis of marine systems. Contracts and specification. Scheduling and planning.

07 11 692 Marine Statutory Regulations

Government administration. International Maritime Organization (IMO). SOLAS. Surveys and certification. Subdivision and stability. Machinery and electric installations. Fire protection. Fire detection and fire extinction. Life-saving appliances. Radiotelegraphy and radiotelephony. Safety of navigation. Carriage of grain. Carriage of dangerous goods. Nuclear ships.

07 12 671 Environmental Loads on Marine Units

Sea waves: Characteristics of wind generated waves. Wave theories. Statistical procedures for analysis of wave data. Evaluation of wave parameters for design. Wave forecasting techniques. Wave forces. Wind load: wind direction and mean velocity. Turbulence effect. Wind forces. Interaction effects. Currents: surface wave modification. Wave-making resistance. Vortex shedding. Scouring and scour prevention.

07 12 672 Offshore Systems



Drilling systems. Types of ocean structures. Support systems. Offshore loading systems. Role of classification societies. Mooring and dynamic positioning systems. Pipe-laying. Diving and submersibles.

07 12 673 Dynamics of Offshore Structures

Single degree of freedom systems. Multi-degree of freedom systems. The analysis of offshore structures by spectral techniques. Wave forces on slender members. Diffraction problems. Effect of currents and winds. Dynamic response of typical structures. Effect of structural vibrations. Uses of models to predict dynamic loads and the response of structures.

07 11 721 Advanced Marine Hydrodynamics (a)

Review of vector algebra. Derivations of equations of motion. Viscous flows. Laminar and turbulent flows. Boundary layer theory. Navier-Stokes equations. Theory of ship resistance. Wave resistance.

07 11 722 Advanced Marine Hydrodynamics (b)

Motion of vessels in waves. Response in regular and irregular seas. Added mass and damping coefficients. Equations of motion of a ship in waves. Hydrodynamic forces and moments. Stability and control. Dynamic simulation.

07 11 731 Advanced Marine Structure Analysis (a)

Review of classical methods of structure analysis. Review of matrix algebra. Matrix methods for structural analysis: force and displacement methods. Methods of virtual work, real and complementary energy.

07 11 732 Advanced Marine Structure Analysis (b)

Finite element methods for marine structural analysis. Element coordinate systems. Numerical integration methods. Basic elements. Plate bending elements. FEM modeling of marine structures. Use of FEM computer packages.

07 11 733 Marine Composite Materials

Materials testing and evaluation. Stress analysis in composite materials. Laminated composite structures. Design considerations of composite structures. Marine applications.

07 11 741 Marine Power Plant Systems (a)

Design of ship power system components. Heat balance studies. Safety and pollution control. Electrical power systems. Modern diesel power plants, different cooling loads.

07 11 742 Marine Power Plant Systems (b)

Principles of fluid system design. Piping systems. Combustion in marine power plants.



Marine gas turbines. Renewable energy. Modern marine power plants.

07 11 743 Application of Energy in the Marine Field

Introduction. Types of energy. Electrical load calculation. Heat and cooling load calculations. Power systems. Fuel consumption. Marine energy systems. Cooling systems.

07 11 751 Marine Utilization of Energy

Primary energy. Types of fuels. Heat values. Renewable energy. Solar energy. Wind energy. Water energy. Fuel cell. Hydrogen fuel. Application of energy saving in the marine field.

07 11 761 Ship Production Planning and Control

Planning and scheduling. Network application in scheduling shipbuilding. Production control. PERT/CPM and other control techniques. Information systems. Standardization.

07 11 762 Quality Assurance Planning in Shipbuilding

Definitions and codes of practice. Quality control. Quality assurance management and planning. Case studies and applications.

07 11 763 Accuracy Control in Shipbuilding

Introduction. Statistical principles. Accuracy control planning. Executing. Evaluation. Applications.

07 11 781 Design of Modern Ship Types

Design of modern ship types such as: hydrofoils, SWATH, multi-hulls, hovercraft, planing craft, etc.

07 11 782 Special Topics in Ship Design

Advances in ship design as seen in recent research. Directed study in advanced topics in ship design.

07 11 783 Computer Applications in the Marine Field

Numerical modeling of ship lines – Numerical methods – CAD/CAM systems – Introduction to artificial intelligence. Software packages for the marine field. Project.

07 11 791 Ship Salvage Operations

Types of casualties. Ship stability. Ship strength. Oil and hazardous substances. Salvage plans and surveys. Foundering. Stranding. Restoring buoyancy. Lifting. Tanker salvage. Offloading hazardous cargos. Salvage calculations.



07 11 792 Marine Pollution: Prevention and Control

Sources of marine pollution. Hazards of marine pollution. Methods and measures of preventing and controlling marine pollution. Oil spill response methods: mechanical containment and recovery, chemical dispersion, in-situ burning, shoreline clean-up, treatment of recovered oil, disposal of oil and oil debris. Clean-up cost analysis.

07 12 771 Dynamics of Ocean Waves

Description and formulation of wave problems in the ocean. Development of classical wave theory. Free waves and forced waves. Diffraction, refraction and reflection of waves. Shallow-water theory.

07 12 772 Response of Offshore Structures

Dynamic response of platforms in regular and irregular seas. Second order forces and moments. Stability in sea waves. Mono-hull and twin-hull platform motion. Sea loads.

07 12 773 Marine Pipelines

Introduction. Materials. Pipe capacity. Limit-state design. Penetration in soil. Hydrodynamics. On-bottom stability. Finite element analysis. Installation.

07 12 774 Underwater Technology

Underwater equipment. Underwater cutting. Underwater welding. Underwater inspection. Underwater repair operations.

07 11 823 Computational Fluid Dynamics in Ship Hydrodynamics

Introduction to CFD. Flow equations. General approximation. Equations of motion. Momentum equations. Turbulence. Computational methods for ship waves. CFD applications to simulate flows around ships

07 11 824 Hydrodynamics of Marine Propellers

Review of basic hydrodynamics equations. Flow past propellers. Aerofoil design. Cavitation phenomena. Propeller types. Propulsive efficiency.

07 11 831 Theory of Ship Structures

Loads on ship structures. Response analysis. Methods of structural stability analysis. Buckling as a design criterion. Limit state analysis. Grillage theory. Theory of plates and shells. Local strength problems.

07 11 832 Marine Structural Reliability

Review of probability theory. Random processes. Extreme value distributions. Analysis of uncertainties. Reliability analysis methods. Modes of failure. Component and system



reliability. Fatigue reliability. Probabilistic description of loads on marine structure. Design considerations.

07 11 833 Marine Structure Dynamics

Dynamic forces on marine structures. Analysis of forces and deformations in marine structures. Single and multiple degrees of freedom systems. Linear and nonlinear response. Response spectra. Introduction to probabilistic methods in structural dynamics. Applications to marine structures.

07 11 834 Structural Optimization

Use of mathematical programming methods for structural design optimization including linear and nonlinear programming methods. Problem formulation. Application to minimum weight and minimum cost design.

07 11 835 Material Fracture Analysis

Elasticity/Plasticity. Fracture mechanics. Failure mechanisms. Structural and environmental factors. Defects. Tolerable and non-tolerable defects. Application to shipbuilding materials.

07 11 841 Advanced Automatic Control in Marine Field

Review of automatic control with marine applications. Ship steering. Ship control. Data logging and control. Computer control. Fluidics. Special topics in marine automation

07 11 842 Advanced Marine Engineering

Shafting system, vibration analysis and alignment – Steering gear systems, hydraulic and electrical – Instrumentation and control systems – Fuel technology, distillation, refining, testing – Watchkeeping and equipment operation, unattended machinery spaces (UMS) operation.

07 11 871 Stochastic Analysis of Ocean Waves

Introduction to probability theory and statistics. Random variables. Evaluation of data. Stochastic processes. Power spectral density techniques.

07 11 601 Diploma Project in Ship Maintenance and Repair

Independent individual study or investigation of problems in a field related to the Diploma, under the supervision of a faculty member.

07 11 602 Diploma Project in Ship Design

Independent individual study or investigation of problems in a field related to the Diploma, under the supervision of a faculty member.



07 11 603 Diploma Project in Offshore Engineering

Independent individual study or investigation of problems in a field related to the Diploma, under the supervision of a faculty member.

07 11 701 Master of Engineering Scientific Report in Marine Engineering

Independent individual report in the field of Marine Engineering, under the supervision of a faculty member.

0712 701 Master of Engineering Scientific Report in Offshore Engineering

Independent individual report in the field of Offshore Engineering, under the supervision of a faculty member.

07 11 705 Master of Science Thesis in Naval Architecture and Marine Engineering

For students working on an advanced research program leading to the completion of the master's thesis. Students registered for the master's degree must register every term in this course starting the third term of their registration. Course is taken on a satisfactory/unsatisfactory basis.

07 11 801 Ph.D. Dissertation in Naval Architecture and Marine Engineering

For students working on an advanced research program leading to the completion of the Ph.D. dissertation. Students registered for the Ph.D. degree must register every term in this course starting the first term after passing their qualifying examination. Course is taken on a satisfactory/unsatisfactory basis.