UNIVERSITY OF SOUTHERN DENMARK

Chapter 9
The programme specific part of the curriculum for

MASTER OF SCIENCE (MSc) IN MARITIME TECHNOLOGY
Cand.tech. i maritim teknologi

Curriculum 2015, Version 1.0

Applicable to students admitted September 2015 onwards

The Curriculum is divided into general provisions (Chapters 1-8), a programme-specific section (Chapter 9), and descriptions of the programme's individual course modules. Students should familiarise themselves with all three parts in order to get a complete overview of the provisions regulating the programme.

Article 1 Job Profile

With a solid foundation in maritime technology and the combination of a practical background and theoretical graduate studies, the graduate is qualified for a variety of jobs especially in maritime industries such as shipping companies, classification companies, offshore companies, equipment manufacturers, consultancies and government authorities.

With a holistic approach to operations, economy, environment and development the graduate will appeal to maritime as well as more land-based sectors and industries. The broad technological skills qualify the graduate for a range of job functions within the maritime sector as well as the offshore industry.

Examples of jobs and tasks

- Consultancy work based on an understanding of operations, environment system analysis, economy and management of maritime structures
- Project management in companies within the maritime sector
- Innovation and development of new components, systems and processes
- Research and development tasks within the academic core competencies of the programme: environmental system analysis, maritime technology and finance
- Optimisation of transport, operations and sustainability
- Strategic tasks in interest organisations, e.g. in relation to the Blue Denmark's continued work as a leading maritime country

Article 2 Competence Profile

The graduate of the master programme in Maritime Technology will have an interdisciplinary perspective on large units such as ships, offshore installations and manufacturing companies – units that can be very complex and therefore must be viewed as a complex system.

Knowledge

A. The graduate will have broad knowledge in a variety of disciplines that combined provide an interdisciplinary overview of the field of maritime and offshore technology. In specific areas such as engineering, operations, safety and risk assessment the graduate will have knowledge that are based on leading international research
B. The graduate can understand, identify and reflect on problems within and across the above academic fields on a scientific basis

Skills

C. The graduate will master scientific methods and tools such as system analyses, cost benefit analyses, optimisation and risk assessment relevant to employment within the subject area
D. The graduate can evaluate and select between the above methods and tools in the area of maritime technology. Based on this the graduate can develop, modify and optimise structures and operation taking into account engineering, economic, social, legal and environmental considerations
E. The graduate can assess the sustainability of technological development as well as analyse and provide environmentally friendly and resource efficient solutions in technological systems, products and processes
F. The graduate can convey knowledge in the subject areas of maritime technology and apply that knowledge at all levels of the sector

Competencies

G. The graduate can manage work and development processes that are complex, unpredictable and require new approaches in, for example, ships and offshore installations – units that are complex and must be viewed and treated as complex system
H. The graduate can, based on a thorough knowledge of the maritime sector, incl. rules, legislation and classification as well as knowledge of maritime technology, independently initiate and implement academic and interdisciplinary collaboration
I. The graduate can assume responsibility for own academic development and specialisation

Qualifications matrix

GRADUATES WILL HAVE ACQUIRED …	MT-BAS1 (1st sem)	MT-MOP1 (1st sem)	MT-STE1 (1st sem)	MT-LSA(2nd sem)	MT-SMO (2nd sem)	MT-RIM (3rd sem)	MT-PRM (3rd sem)	MT-SP30 / MT-SP40 (4th sem)
RESEARCH BASED KNOWLEDGE								
A		X	X	X	X	X		X
B	X	X	X	X	X	X	X	X
THE FOLLOWING SKILLS (ON A SCIENTIFIC BASIS)								
C	X	X	X	X	X	X		X
D	X	X	X	X	X	X	X	X
E					X	X		X
F		X	X		X	X	X	X
THE FOLLOWING COMPETENCES (ACADEMIC AND INTERDISCIPLINARY)								
G		X	X	X	X	X		X
H		X	X	X	X	X	X	X
I				X	X	X	X	X

Article 3 Academic Progression

The competencies of the students are developed through subjects structured within the first three semesters of the master programme and finally in the master thesis on 4th semester.
The teaching will be planned and coordinated in close interaction between the teachers. This ensures a natural link between the academic topics of each semester as well as a good progression throughout the study programme.

Core competences
Three key competences are acquired from this programme, namely Structural Analysis, Environment and Transport Economics. This will enable the student to gain a broad range of knowledge with good interdisciplinary skills. These competences will be continually developed through the 2 years of study.

Structural analyses:

- Strength, deformation and fatigue analyses of structural elements and machineries
- Loads on ocean structures (wind, waves, currents and ice)
- Reliability and risk analyses of structural systems and equipment

Transport Economy:

- World economy and transport
- Connection between trade, production and transport
- Financial investment evaluation of production
- Reliability and risk analyses of operation

Environment:

- Sustainable development and life cycle assessment
- Environmental law and regulation
- Monetisation environmental impacts
- Environmental risk assessment

Cross-disciplinary approach
The programme will have a strong focus on interdisciplinarity between technology, economics, operation, environment, safety, risk and law.

Practical – operational knowledge
Students with a maritime professional bachelor degree will retain their valuable practical and operational oriented skills. Therefore both the teaching and the formulation of projects will seek to give this special consideration.

Project management and presentation skills
Theory and projects will be of increasing depth and complexity, which will also increase the students' expertise within project management and communication. Throughout the programme there will be a strong focus on both oral and written presentation skills. The objective is to enable students to disseminate

knowledge and communicate across an organization.

English as the language of communication

Internationalisation and cultural understanding is an integral part of the study programme. Therefore, English is the language of communication in teaching activities, study materials and student project assignments.

Article 4 Structure and Context

First semester
The first semester courses are structured to adapt to the admission level – according to the entry requirements mentioned later in this document.
During the course '*Basics of Applied Science'* students will obtain skills in mathematics, statics and strength of materials, which are prerequisites for later courses.

In the courses '*Ship technology'* and '*Maritime Operation'* students will obtain knowledge about general topics in the maritime field such as design and operation of ships, the maritime sector (organizations, classifications and legislation), safety, economics and human factors. The technical skills will serve as the foundation for the project work throughout the studies as well as enable graduates to independently carry out projects and communicate results.

Second semester
'Loads and Structural Analysis' builds on the semester course '*Basics in Applied Science'.* The course enables students to handle large structures as well as small machine elements with regard to stress, deformation, fracture and fatigue. Topics related to loads and motions of structures exposed to wind and waves are considered, which will enable students to identify critical problems and use these analyses to provide suggestions for design modification.

'Sustainable Maritime Operation'. Based on the competencies acquired in the courses '*Ship Technology'* and *'Maritime Operation'* focus will be on economic and environmental sustainability. The course will include elements such as profitability of cleaner technology as well as conversion and retrofit for emission reduction. The core disciplines of the course will be related to an innovation context.

Third semester
The acquired skills and competencies in engineering, operations, economics, and environmental and human factors will be considered in a risk management perspective. The main objective of the course *'Risk Management'* is to provide students with knowledge enabling them to provide relevant recommendations to decision makers in a company. Thus the course includes topics such as risk analysis, safety assessment and legal issues.

In the course *'Project Management'* students will acquire project management skills.

The rest of the third semester allows students to shape the programme in accordance with their preferences. The semester can therefore be planned in different ways.
The options are:

- Elective courses equivalent to 15 ECTS
- In-company period equivalent to 15 ETCS
- Elective courses of 5 ETCS + extended master thesis of 10 ETCS

The elective courses offered give the student a chance to build up the necessary competencies in specific areas as an important support to the profile courses. The student may select courses already offered by the Faculty of Engineering provided that the prerequisites competencies for the course have been achieved.

It is also possible to use the semester to study abroad.

Fourth semester
Fourth semester is the master thesis semester. The master thesis must demonstrate that the student can apply the acquired methods and skills.

It is expected that the majority of the theses are performed in cooperation with a company and/or that they are related to current research projects of one or more of the departments associated with the programme.

Article 5 Structure and Modules

<table>
<tr><th>Semester</th><th colspan="30">Modules</th></tr>
<tr><td>4 semester</td><td colspan="30">Master's Thesis
MT-SP30/MT-SP40**</td></tr>
<tr><td>3 semester</td><td colspan="10">Risk Management
MT-RIM</td><td colspan="5">Project Management
MT-PRM</td><td colspan="5">Elective/
In-company Period*</td><td colspan="5">Elective/
In-company Period*/
Master's Thesis**</td><td colspan="5">Elective/
In-company Period*/
Master's Thesis**</td></tr>
<tr><td>2 semester</td><td colspan="10">Loads and Structural Analyses
MT-LSA</td><td colspan="20">Sustainable Maritime Operation
MT-SMO</td></tr>
<tr><td>1 semester</td><td colspan="10">The Basics in Applied Science
MT-BAS1</td><td colspan="10">Maritime Operation
MT-MOP1</td><td colspan="10">Ship Technology
MT-STE1</td></tr>
<tr><td>ECTS</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr>
</table>

* The student may choose to spend 15 ECTS elective courses on an In-company Period (MT-VF).
Students on a 4+4 PhD programme may use their 15 ECTS electives on third semester together with the 30 ECTS on fourth semester on a 45 ECTS master thesis.

** If the master's thesis is of an experimental nature, the student may choose to spend 10 ECTS of the 3rd semester's elective courses on the thesis work. The master's thesis will then be extended to 40 ECTS.

Article 6 Qualifying Degrees for Admission

6.1 Qualifying degrees

The master programme in Maritime Technology is an opportunity for further education for graduates with a maritime professional bachelor degree. The following bachelor degrees are directly qualifying for the master programme in Maritime Technology. The list is not exhaustive.

- Bachelor of Maritime Transport and Ship Management (Skibsofficer, Skibsfører, Professionsbachelor i maritim transport og skibsledelse) – SIMAC, Svendborg International Maritime Academy
- Bachelor of Technology Management and Marine Engineering (Maskinmester, Professionsbachelor i maritim og maskinteknisk ledelse og drift) – Fredericia Maskinmesterskole
- Bachelor of Technology Management and Marine Engineering (Maskinmester, Professionsbachelor i maritim og maskinteknisk ledelse og drift) – MARTEC, Frederikshavn
- Bachelor of Technology Management and Marine Engineering (Maskinmester, Professionsbachelor i maritim og maskinteknisk ledelse og drift) – Maskinmesterskolen København
- Bachelor of Technology Management and Marine Engineering (Maskinmester, Professionsbachelor i maritim og maskinteknisk ledelse og drift) – SIMAC, Svendborg International Maritime Academy
- Bachelor of Technology Management and Marine Engineering (Maskinmester, Professionsbachelor i maritim og maskinteknisk ledelse og drift) – Aarhus Maskinmesterskole

6.2 Level and content of qualifying degrees

Qualifying bachelor and professional bachelor degrees in the scientific and technical area where the level and content of the scientific and technical courses correspond to a bachelor of science degree or a professional bachelor degree in the subject area of the MSc in Maritime Technology programme.

6.3 Academic content of qualifying degree

MSc in Maritime Technology admits applicants with a bachelor degree or a professional bachelor degree in the area of marine engineering and maritime technology and/or in the area of maritime transport and ship management cf. 6.2 provided that the degree covers:

Subject knowledge	**Extent**
Maritime technology	30 ECTS
Ship management	20 ECTS

Furthermore the following entry requirements must be met:

- Mathematics - Danish B-level (or corresponding to)
- English - Danish B-level (or corresponding to)

6.4 Additional courses
Should the applicant's degree fail to meet the requirements mentioned in 6.1 - 6.3, it is not possible to acquire the necessary skills through additional courses during the first year of study because no such courses are offered at the University of Southern Denmark, as is required under the law.

6.5 Admission with a foreign degree
Applicants with a bachelor degree or professional bachelor degree from a foreign university who meet the requirements of 6.2 and 6.3 are eligible for admission subject to an academic assessment and comparison of whether the applicant's academic qualifications correspond to those of qualifying Danish degree.

6.6 Possible exemptions
Applicants whose bachelor degree or professional bachelor degree fails to meet the terms stated in 6.1 – 6.5 are not eligible for admission.

Applicants who do not hold a bachelor degree or a professional bachelor degree but who have the academic qualifications equivalent thereto are eligible for admission should their qualifications, based on an academic assessment and comparison, correspond to those of a qualifying Danish degree.

Two-year transitional arrangement regarding additional courses:
Completed and passed additional courses, i.e. single courses from existing bachelor programmes at the University of Southern Denmark or elsewhere, may be included in the application for admission until 31 August 2016.

Article 7 External Examiners and the Academic Study Board

The programme belongs under the Academic Study Board of the Faculty of Engineering and the national corps of external examiners for engineering programmes.

Article 8 Entry into Force and Amendments

1. Approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 27 January 2015.

2. Amendments approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 18 March 2015.

3. Amendments approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 20 October 2015.