

# Contents

|       |                                                                                                              |    |
|-------|--------------------------------------------------------------------------------------------------------------|----|
| 1     | Introduction .....                                                                                           | 2  |
| 2     | The “MAREM” Project objectives and goals .....                                                               | 2  |
| 3     | Modern maritime safety and security matters and requirements to the<br>maritime education and training ..... | 3  |
| 3.1   | Actual considerations on maritime safety .....                                                               | 3  |
| 3.2   | Best practices in maritime security .....                                                                    | 4  |
| 3.3   | Challenges for training in maritime safety and security .....                                                | 5  |
| 4     | Development of the Master degree curricula .....                                                             | 6  |
| 5     | Master degree courses .....                                                                                  | 7  |
| 5.1   | Management of security threats .....                                                                         | 7  |
| 5.2   | Safety based ship design .....                                                                               | 8  |
| 6     | Conclusions .....                                                                                            | 9  |
| 7     | References .....                                                                                             | 9  |
|       | Maritime security threats Instructor Manual .....                                                            | 38 |
|       | Chapter I Introduction to the course .....                                                                   | 40 |
| 1.1   | Aims of the course .....                                                                                     | 40 |
| 1.1.1 | Aims .....                                                                                                   | 40 |
| 1.1.2 | Objective .....                                                                                              | 40 |
| 1.2   | Actuality and problematic of the topic being studied .....                                                   | 41 |
| 1.3   | Organization of the course .....                                                                             | 41 |
| 1.4   | Review of the methods used for teaching .....                                                                | 42 |

|             |                                                                                                                            |    |
|-------------|----------------------------------------------------------------------------------------------------------------------------|----|
| Chapter II  | Contemporary problems of maritime security .....                                                                           | 43 |
| 2.1         | Historical aspects of the maritime security problem .....                                                                  | 43 |
| 2.2         | Ship and port operations .....                                                                                             | 44 |
| 2.3         | Legal frameworks for maritime security .....                                                                               | 44 |
| 2.4         | Maritime security policies .....                                                                                           | 45 |
| Chapter III | Maritime transportation system within the context of maritime<br>security .....                                            | 46 |
| 3.1         | Public policy and maritime responsiveness to commerce .....                                                                | 46 |
| 3.2         | Economic dependence on maritime transportation .....                                                                       | 46 |
| 3.3         | A renewed emphasis on security ships and ports .....                                                                       | 47 |
| 3.4         | A need for partnership between governmental institutions and business<br>organizations in managing maritime security ..... | 47 |
| Chapter IV  | Current maritime security threats and their nature .....                                                                   | 49 |
| 4.1         | Categories of maritime security threats .....                                                                              | 49 |
| 4.1.1       | According to the direction of the "vector" of impact .....                                                                 | 49 |
| 4.1.2       | According to the reasons .....                                                                                             | 49 |
| 4.2         | Threats of the maritime security .....                                                                                     | 49 |
| 4.3         | Analysing each threat of the maritime security – historical, geographical,<br>legal frames .....                           | 50 |
| 4.3.1       | Geographical frameworks – For Bulgaria and Romania .....                                                                   | 50 |
| 4.3.2       | Historical frameworks .....                                                                                                | 50 |
| 4.3.3       | Legal framework .....                                                                                                      | 51 |
| 4.4         | General model of a Maritime Security Threat .....                                                                          | 51 |
| 4.5         | Connection between threats – The“Four Circles”Model. ....                                                                  | 51 |
| Chapter V   | Terrorism and commercial maritime transportation .....                                                                     | 53 |
| 5.1         | The legal definition of terrorism .....                                                                                    | 53 |
| 5.2         | Historical, geographical and legal aspects of phenomenon terrorism .....                                                   | 53 |
| 5.3         | Characteristics of contemporary maritime terrorism .....                                                                   | 54 |
| 5.4         | Subjects of terrorist threat .....                                                                                         | 55 |
| 5.5         | Typical examples .....                                                                                                     | 55 |

|              |                                                                                                        |    |
|--------------|--------------------------------------------------------------------------------------------------------|----|
| Chapter VI   | Piracy and armed robbery .....                                                                         | 57 |
| 6.1          | The legal definition of piracy and armed robbery .....                                                 | 57 |
| 6.2          | Historical, geographical and legal aspects of piracy and armed robbery .....                           | 57 |
| 6.3          | Characteristics of contemporary piracy and armed robbery .....                                         | 58 |
| 6.4          | Subjects of piracy and armed robbery .....                                                             | 58 |
| 6.5          | Typical examples .....                                                                                 | 59 |
| Chapter VII  | Stowaways .....                                                                                        | 61 |
| 7.1          | The legal definition of stowaways .....                                                                | 61 |
| 7.2          | Historical, geographical and legal aspects of stowaways .....                                          | 61 |
| 7.3          | Characteristics of phenomenon stowaways – motivation .....                                             | 62 |
| 7.4          | Tactics and techniques used by stowaways .....                                                         | 62 |
| Chapter VIII | Transnational organized crime .....                                                                    | 65 |
| 8.1          | The illicit trade in hazardous materials .....                                                         | 65 |
| 8.2          | The illicit trade in small arms and light weapons .....                                                | 66 |
| 8.3          | Human trafficking .....                                                                                | 67 |
| 8.4          | Illegal drug origins and production .....                                                              | 67 |
| 8.5          | Maritime smuggling routes and trends – Balkans .....                                                   | 69 |
| 8.6          | Drug smuggling methods and techniques .....                                                            | 70 |
| Chapter IX   | Internal criminal conspiracies .....                                                                   | 72 |
| 9.1          | Cargo theft .....                                                                                      | 72 |
| 9.2          | Other matters about maritime security .....                                                            | 74 |
| 9.3          | Commercial conspiracies .....                                                                          | 74 |
| Chapter X    | Inter-state hostilities .....                                                                          | 75 |
| 10.1         | Defining, varieties, identical signs .....                                                             | 75 |
| 10.2         | Historical, geographical, legal frames - typical examples for international arguments in the sea ..... | 76 |
| 10.3         | Factors, heightening the threats in the sea .....                                                      | 76 |
| 10.4         | Subjects of the threat. ....                                                                           | 77 |

|                     |                                                                                  |            |
|---------------------|----------------------------------------------------------------------------------|------------|
| <b>Chapter XI</b>   | <b>Methods of assessment the risks of the security of a critical marine unit</b> | <b>86</b>  |
| 11.1                | Basics of analyzing the risks                                                    | 86         |
| 11.2                | Methods used while calculating the risk                                          | 86         |
| 11.3                | Assessment the risk based on two factors                                         | 86         |
| 11.4                | Assessment the risk based on three factors                                       | 87         |
| 11.5                | Assessment the threats and vulnerability                                         | 87         |
| 11.6                | Assessment the gravity of the consequences                                       | 88         |
| <b>Chapter XII</b>  | <b>Ship security assessment</b>                                                  | <b>89</b>  |
| 12.1                | Introduction to the SSA                                                          | 89         |
| 12.2                | Organizing the SSA                                                               | 90         |
| 12.3                | Inspecting the security                                                          | 90         |
| 12.4                | Documenting the SSA                                                              | 91         |
| <b>Chapter XIII</b> | <b>Port facility (Port) security assessment</b>                                  | <b>99</b>  |
| 13.1                | Introduction to the PFSA (PSA)                                                   | 99         |
| 13.2                | Organizing the PFSA (PSA)                                                        | 99         |
| 13.3                | Inspecting the security                                                          | 101        |
| 13.4                | Documenting the PFSA                                                             | 101        |
| <b>Chapter XIV</b>  | <b>Offshore facility security assessment</b>                                     | <b>108</b> |
| 14.1                | Introduction to the OFSA                                                         | 108        |
| 14.2                | American vision of OFSA                                                          | 109        |
| 14.3                | Australian vision of OFSA                                                        | 111        |
| 14.4                | Benefits of Risk Assessment Applications                                         | 111        |
| <b>Chapter XV</b>   | <b>Fundamentals of scenario approach in maritime security threats</b>            | <b>112</b> |
| 15.1                | Characteristics and parameters of scenario approach                              | 112        |
| 15.2                | Forms of presentation of scenario approach – strengths and weakness              | 113        |
| 15.3                | Descriptive form of presentation                                                 | 113        |
| 15.4                | Matrix form of presentation                                                      | 114        |
| 15.5                | Tree form of representation                                                      | 114        |

|               |                                                                                                 |     |
|---------------|-------------------------------------------------------------------------------------------------|-----|
| Chapter XVI   | Application of scenario approach in maritime security threats .....                             | 116 |
| 16.1          | Choice of priorities in scenario approach of maritime security threats .....                    | 116 |
| 16.2          | Choice of applicable forms in scenario approach of maritime security threats .....              | 116 |
| 16.3          | Methods of limiting uncertainty in scenario approach of maritime security threats .....         | 117 |
| 16.4          | Possibilities of this type scenario approach application .....                                  | 117 |
| Chapter XVII  | Application of scenario approach in maritime security vulnerabilities .....                     | 120 |
| 17.1          | Choice of priorities in scenario approach of maritime security vulnerabilities .....            | 121 |
| 17.2          | Choice of applicable forms in scenario approach of maritime security vulnerabilities .....      | 122 |
| 17.3          | Methods of limiting uncertainty in scenario approach of maritime security vulnerabilities ..... | 122 |
| 17.4          | Possibilities of this type scenario approach application .....                                  | 123 |
| Chapter XVIII | Maritime forces and security of merchant shipping .....                                         | 131 |
| 18.1          | Naval coordination and Guidance for shipping .....                                              | 131 |
| 18.2          | Operation Active Endeavour .....                                                                | 132 |
| 18.3          | Other allied maritime security operations .....                                                 | 133 |
| 18.4          | Information exchange in the Red Sea, Arabian Sea, and Arabian Gulf .....                        | 134 |
| Chapter XIX   | Intelligence in maritime security .....                                                         | 135 |
| 19.1          | Role of intelligence in maritime security .....                                                 | 135 |
| 19.2          | The intelligence cycle .....                                                                    | 136 |
| Chapter XX    | Threat mitigation strategies (criminals) .....                                                  | 138 |
| 20.1          | Types of behavior and activities to pose a security threat .....                                | 138 |
| 20.2          | Types of behavior and activities of terrorists to pose a security threat .....                  | 140 |
| Chapter XXI   | Hostage survival and rescue .....                                                               | 142 |
| 21.1          | Hostage survival techniques .....                                                               | 142 |

|                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------|-----|
| 21.2 Properly reactions to possible rescue operations .....                                             | 144 |
| Chapter XXII Maritime security equipment .....                                                          | 146 |
| 22.1 General equipment used by maritime security .....                                                  | 146 |
| 22.2 Solutions for increasing the maritime security .....                                               | 147 |
| 22.3 Systems and security equipment .....                                                               | 148 |
| 22.4 Using the maritime security equipment .....                                                        | 149 |
| Chapter XXIII Maritime security responsibilities and authorities .....                                  | 150 |
| 23.1 Governments' responsibilities .....                                                                | 150 |
| 23.2 Responsibilities of Recognized Security Organizations .....                                        | 151 |
| 23.3 Maritime security responsibilities of the company, the ship and the port<br>facility .....         | 151 |
| 23.4 Responsibilities of the security officers of the ship, company and port<br>facility .....          | 152 |
| Chapter XXIV Security's responsibilities of the merchant ship .....                                     | 154 |
| 24.1 Perimeter security of the merchant ship .....                                                      | 154 |
| 24.2 Control of access to the merchant ship .....                                                       | 155 |
| 24.3 Basic security procedures considering of the merchant ship .....                                   | 156 |
| Chapter XXV Interaction between the merchant ship and the port facility in<br>security's interest ..... | 158 |
| 25.1 Organization of the security of the port and its aquatory .....                                    | 158 |
| 26.2 Control and management of the access .....                                                         | 159 |
| 26.2.1 Control and management of the access in a PF .....                                               | 159 |
| 26.2.2 Control and management of access in a ship .....                                                 | 160 |
| 26.3 Features of the interaction .....                                                                  | 161 |
| 26.3.1 Declaration of Security .....                                                                    | 161 |
| 26.3.2 Pre-arrival list .....                                                                           | 162 |
| Chapter XXVII Maritime security administration .....                                                    | 166 |
| 27.1 Levels of maritime security administration .....                                                   | 166 |
| 27.2 Making a report about accidents considering the security of the ship .....                         | 168 |

|                                                                                                      |         |
|------------------------------------------------------------------------------------------------------|---------|
| 27.3 Audits and inspections of the security of the ship .....                                        | 169     |
| 27.4 Verification and certification of the ship and port facility .....                              | 169     |
| 27.5 Voluntary ship and port facility security assessment .....                                      | 170     |
| <br>Chapter XXVIII Fundamentals of training for opposition to threats for maritime<br>security ..... | <br>180 |
| 28.1 Basic security knowledge and skills for those who work in the maritime<br>industry .....        | <br>180 |
| 28.1.1 Basic security knowledge and skills for those who work in the<br>maritime industry. ....      | 180     |
| 28.2 Techniques for training .....                                                                   | 182     |
| 28.3 Types of training – traditional and computer assisted .....                                     | 182     |
| 28.4 Scenario as a tool of the security training .....                                               | 182     |
| <br>Chapter XXIX Methodology for conducting maritime security training and drills ....               | <br>184 |
| 29.1 Maritime security training and drills .....                                                     | 184     |
| 29.1.1 Maritime security training .....                                                              | 184     |
| 29.1.2 Maritime security drills .....                                                                | 185     |
| 29.2 Planning, preparation and conducting maritime security training and<br>drills .....             | <br>185 |
| 29.2.1 Planning maritime security training and drills .....                                          | 186     |
| 29.2.2 How to conduct effective workout .....                                                        | 187     |
| 29.3 Evaluation of the maritime security training and drills .....                                   | 188     |
| 29.4 Reporting for the maritime security training and drills .....                                   | 188     |
| <br>Chapter XXX Methodology for conducting maritime security exercises .....                         | <br>189 |
| 30.1 Maritime security exercises .....                                                               | 189     |
| 30.2 Planning, preparation and conducting maritime security exercises .....                          | 190     |
| 30.2.1 Guiding principles of planning, preparation and conducting of these<br>exercises .....        | <br>190 |
| 30.2.2. Every exercise includes the following stages .....                                           | 191     |
| 30.2.3 Instrument .....                                                                              | 191     |
| 30.3 Evaluation of the maritime security exercises .....                                             | 191     |
| 30.4 Reporting for the maritime security exercises .....                                             | 192     |

|                                                                                                  |     |
|--------------------------------------------------------------------------------------------------|-----|
| Safety based ship design Instructor Manual .....                                                 | 205 |
| Chapter I Introduction to ship design .....                                                      | 207 |
| 1.1 General .....                                                                                | 207 |
| 1.2 The ship design process .....                                                                | 209 |
| Chapter II Ship design principles and criteria .....                                             | 212 |
| 2.1 Design principles in ship economics .....                                                    | 212 |
| 2.2 Design criteria for valuation of human life, health and safety .....                         | 213 |
| 2.3 IMO Goal-based standards .....                                                               | 214 |
| Chapter III Legal requirements in ship design .....                                              | 216 |
| 3.1. Rules and regulations for ship design .....                                                 | 216 |
| 3.2 Classification society's standard requirements .....                                         | 220 |
| Chapter IV Integration of safe concept and operation in ship design process .....                | 226 |
| 4.1 Marine technology and human factor .....                                                     | 226 |
| 4.2 Integration of variable elements into ship design process .....                              | 228 |
| 4.3 Ship complex systems management .....                                                        | 230 |
| Chapter V Safety assessment methodology .....                                                    | 232 |
| 5.1 Introduction in formal safety assessment .....                                               | 232 |
| 5.2 Applying of formal safety assessment in shipping industry Identification<br>of hazards ..... | 233 |
| Chapter VI Reliability based design in ship building .....                                       | 237 |
| 6.1 Reliability-based design .....                                                               | 237 |
| 6.2 Current practice in reliability-based design of ship structure .....                         | 238 |
| 6.3 Emerging technology .....                                                                    | 240 |
| Chapter VII Risk management in ship design                                                       |     |
| 7.1 Risk evaluation criteria .....                                                               | 242 |
| 7.2 Criteria for evaluation of high-risk level .....                                             | 243 |
| 7.3 Risk management for designing of systems and functions .....                                 | 244 |

|              |                                                                                              |     |
|--------------|----------------------------------------------------------------------------------------------|-----|
| Chapter VIII | Operational standards for safety based designed ships .....                                  | 245 |
| 8.1          | Safety standards for designing and building of ships .....                                   | 245 |
| 8.2          | Safety standards in operational of special designed ships .....                              | 249 |
| Chapter IX   | Role of safety based ship design concepts in collision and grounding .....                   | 253 |
| 9.1          | Novel design for prevention of collision and grounding .....                                 | 253 |
| 9.2          | Tools for assessing the frequency of collision and grounding events .....                    | 254 |
| 9.3          | Structural damage assessment .....                                                           | 258 |
| Chapter X    | Applying of safety based design concept for ship damage stability and<br>survivability ..... | 263 |
| 10.1         | State-of-the-art in assessing damage stability of ships .....                                | 263 |
| 10.2         | Damage stability and survivability design .....                                              | 265 |
| Chapter XI   | Safety-based design for offshore vessels .....                                               | 267 |
| 11.1         | Safety approach and formal safety assessment of offshore ships .....                         | 267 |
| 11.2         | Innovative offshore vessels design .....                                                     | 272 |
| Chapter XII  | New designing concepts in life saving equipments .....                                       | 274 |
| 12.1         | Evacuation models .....                                                                      | 274 |
| 12.2         | Alternative design and arrangements of life-saving appliances .....                          | 275 |
| 12.3         | Innovative life-saving equipments .....                                                      | 281 |
| Chapter XIII | Future concepts in ship design .....                                                         | 283 |
| 13.1         | Ships of the future .....                                                                    | 283 |
| Chapter XIV  | Assessment of alternative design solutions .....                                             | 291 |
| 14.1         | Cost and revenue components .....                                                            | 291 |
| 14.2         | Economic evaluations .....                                                                   | 295 |
| 14.3         | Techno-economical models .....                                                               | 298 |
| Chapter XV   | Environmental considerations for new designed ships .....                                    | 301 |
| 15.1         | Designing of technologies to reduce environmental impact from ships .....                    | 301 |
| 15.2         | Environmental impact of ship building and maintenance activities .....                       | 309 |