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**(Institution)**

**(Department)**

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| **Issue Date :**  | **Revision Date: -** | **Revision Number: -** | **Faculty Board Decision Number:**  |

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| **Course Name**: **RADAR NAVIGATION** | **Degree:** Bachelor |
| **Code** | **Year/Semester** | **Local Credits** | **ECTS Credits** | **Course Implementation, Hours/Week** |
| **Course** | **Tutorial**  | **Workshop** |
|  |  |  | **5** | **14/7** | - | **14/7** |
| **Department** |  |
| **Instructors** |  |
| **Contact Information** |  |
| **Office Hours** |  |
| **Web page**  | <https://www.marplat.eu>  |
| **Course Type** | Elective | **Course Language** | English |
| **Course Prerequisites** | At discretion of each partner university |
| **Course Category by Content, %** | **Basic Sciences** | **Engineering Science** | **Engineering Design** | **Humanities** |
| 20 | 70 | - | 10 |
| **Course Description** | This course forms part of the proposed Modular Framework for vocational and professional qualification based on a degree program in Maritime Transportation Engineering. The Programme gives trainees in-depth expertise of managing a naval vessel as a Deck Officer and ultimately as the captain of the vessel. The emphasis is upon nautical systems and topics and their applications in navigating a ship in coastal navigation. |
| **Course Objectives**  | 1. To teach trainees basic theory and operational principles of a marine radar system.
2. To familiarise trainees with radar and ARPA performance standards.
3. To familiarise trainees with radar equipment performance limitations and accuracy.
4. To teach trainees to conduct safe navigation, to fix ship position and maintain position control using radar.
5. To teach trainees to maintain manual radar plotting
6. To teach trainees to determine motion elements, CPA, TCPA of a target ship
7. To teach trainees identify a risk of collision and take actions to avoid collision using radar in accordance with the COLREG.
8. To advise trainees against dangers of over-reliance on radar equipment and factors including errors which may affect the data accuracy.
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| **Course Learning Outcomes**  | Cadets passing the course successfully will acquire knowledge and skills as listed below and will be able to be.1. Understand fundamental operational principles of radar
2. Familiarize with the Marine Radar Equipment
3. Able to make correct radar settings and adjustments
4. Able to make manual radar plotting
5. Understand factors affecting radar performance
6. Able to operate of ARPA or TT and AIS
7. Knowledge and application of COLREG using radar
8. Able to conduct safe navigation
9. Perform radar ship position fixing and monitoring
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| **Instructional Methods and Techniques** | Lecturing and Simulator Studies |
| **Tutorial Place** | Classroom and Simulator |
| **Co-term Condition** | **-** |
| **Textbook** | 1. Bole, A., Wall, A. & Norris, A. (2014). Radar and ARPA Manual. Radar and Target Tracking for Professional Mariners, Yachtsmen and Users of Marine Radar. Butterworth-Heinemann.
2. Bowditch, N. (1990). The American Practical Navigator. Defence Mapping Agency.
3. IMO (2019). Radar Navigation at Management Level (Radar, ARPA, Bridge teamwork and search and rescue). Model course 1.08.
4. IMO (2017). [Radar Navigation at Operational Level. Model Course 1.07.](https://www.amnautical.com/products/model-course-1-07-radar-navigation-at-operational-level-2017-edition?variant=41481012233)
5. Unit Handout, Power Point Slides
 |
| **Other References** | 1. Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)
2. IMO SN/Circ. 197.(1997). Operation of Marine Radar for SART Detection.
3. MSC.192(79). Revised Recommendation on Performance Standards for Radar Equipment, 2004
4. IMCO Resolution A.422(XI) (adopted on 15 November 1979). Performance Standards for Automatic Radar Plotting Aids (ARPA)
5. IMCO Resolution A.477(XII) (adopted on 19 November 1981). Performance Standards for Radar Equipment
6. IMO Resolution A.823(19) (adopted on 23 November 1995). Performance Standards for Automatic Radar Plotting Aids (ARPAs)
7. Resolution MSC.64(67) (adopted on 4 December 1996) Adoption of New and Amended Performance Standards MSC. 67/22/ Add. 1
8. MSC\69\22-A1 Annex 12 Resolution MSC.74(69) (adopted on 12 May 1998) Adoption of New and Amended Performance Standards. MSC 69/22/Add.1
9. STCW Table A-II/1 Competence: 1.1. Use of radar and ARPA to maintain safety of navigation
10. MSC\79\23 Annex 34 Resolution MSC.192(79) (adopted on 6 December 2004). Adoption of the Revised Performance Standards for Radar Equipment. MSC 79/23/Add.2
 |
| **Homework & Projects** | Each group will prepare reconstructed radio navigation accident situation which will be used during the simulator exercise as directed by the lecturer. |
| **Laboratory Work** | Simulator Exercise and manual radar plotting |
| **Computer Use** | Bridge and ARPA Radar simulator Programs and PowerPoint for lecturing |
| **Other Activities** | 5 video tutorials shall be recorded in the simulator/lab from the selected practical training activities, Group Discussions |

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| **Assessment Criteria** | **Activities** | **Quantity** | **Effects on Grading, %** |
| Attendance |  |  |
| Midterm |  |  |
| Quiz | **1** | **10** |
| Homework |  |  |
| Term Paper/Project |  |  |
| Laboratory Work |  |  |
| Practices | **2** | **40** |
| Tutorial  |  |  |
| Seminar |  |  |
| Presentation |  |  |
| Field Study |  |  |
| Final Exam | **1** | **50** |
| **TOTAL** | **4** | **100** |
| Effects of Midterm on Grading, % |  | **50** |
| Effects of Final on Grading, % |  | **50** |
| **TOTAL** |  | **100** |

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| **ECTS/****WORKLOAD TABLE** | **Activities** | **Count** | **Hours** | **Total Workload** |
| Lecture  | **10** | **2** | **20** |
| Midterm | **5** | **2** | **10** |
| Quiz | **1** | **2** | **2** |
| Homework | **5** | **2** | **10** |
| Term Paper/Project |  |  |  |
| Laboratory Work | **10** | **2** | **20** |
| Practices | **10** | **2** | **20** |
| Tutorial  | **10** | **2** | **20** |
| Seminar |  |  |  |
| Presentation | **5** | **2** | **10** |
| Field Study | **5** | **10** | **10** |
| Final Exam | **1** | **4** | **4** |
| **Total Workload** |  |  | **28** |
| **Total Workload/25** |  |  | **126/25** |
| **Course ECTS Credits** |  |  | **5** |

| **Week** | **TOPICS** | **Course Outcomes** |
| --- | --- | --- |
| **1** | **INTRODUCTION**Introduction of the course, Familiarization with Simulators**,**  | 1 |
| **2** | **BASIC THEORY AND FUNDAMENTAL PRINCIPLES OF MARINE RADAR SYSTEM** - Fundamental principles of radar- Performance standards for radar equipment- Factors of radar equipment affecting radar detection- Factors external to radar equipment affecting radar detection- Factors affecting normal radar observation | 2 |
| **3** | **RADAR SETTING AND OPERATION****-** Setting up and maintaining optimum radar display- Accurate measurement of ranges and bearings | 3, 5 |
| **4** | **RADAR USE FOR SAFE NAVIGATION**- Ship position fixing using radar- Parallel index (PI) line techniques- Radar navigation- Blind navigation- Radar navigation aids (AtoN)- Maps, navigation lines and routes for radar navigation- Electronic chart overlay on radar picture | 3, 5, 8 |
| **5** | **MANUAL RADAR PLOTTING** - Use of Maneuvering board for manual radar plotting**-** Relative motion triangle and relative motion lines (RML)**-** Determine a course, speed and aspect of a target ship- Determination of targets CPA and TCPA- Determination of targets maneuvers  | 4, 5, 8 |
| **6** | **ARPA SYSTEM OR RADAR TARGET TRACKING (TT) AND AIS** - Setting up and maintaining ARPA or TT monitoring- Setting up and maintaining AIS targets monitoring- Determination of targets information using ARPA, TT and AIS- Errors of interpretation of target data- Causes of errors in displayed data- Risks of over-reliance on ARPA or TT and AIS information | 6, 8, 9 |
| **7** | **APPLICATION OF COLREG WHEN USING RADAR**- Proper use of radar and full and complete interpretation of radar information - Radar related factors affecting safe speed- Methods and characteristics of acquiring sufficient radar information- Actions to avoid collision based on sufficient radar information and in accordance with COLREG rules | 7, 8, 9 |
| **8** | **RADAR SETTING AND OPERATION SIMULATOR PRACTICES**- Radar setting up and adjustment- Accurate measurement of ranges and bearings | 5, 8, 9 |
| **9** | **SAFE NAVIGATION USING RADAR SIMULATOR PRACTICES**- Ship position-fixing using radar- PI line navigation | 5, 6, 8 |
| **10** | **SAFE NAVIGATION USING RADAR SIMULATOR PRACTICES**- Navigation using radar maps, navigation lines and routes | 5, 6, 8 |
| **11** | **MANUAL RADAR PLOTTING PRACTICES**- Acquiring motion elements of target ships- Effects of course alterations and/or course on RML- Manual radar plotting | 4, 5, 8 |
| **12** | **OPERATION OF ARPA OR TT AND AIS SIMULATOR PRACTICES****-** Operation of ARPA or TT and AIS reporting functions | 6, 8, 9 |
| **13** | **OPERATION OF ARPA OR TT AND AIS SIMULATOR PRACTICES**- Determination of maneuver using ARPA or TT | 6, 8, 9 |
| **14** |  **APPLICATION OF COLREG SIMULATOR PRACTICES**- Ship handling for collision avoidance | 7, 8, 9 |

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| ***Prepared by***Lecturer, senior instructor Arvydas Jankauskas | **Date**14 of April, 2022 | Signature |