**MARITIME FACULTY**

**Maritime Transportation Engineering Department**

**Course Catalogue Form**

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

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| **Course Name**: **CELESTIAL NAVIGATION PART I** | | | | | **Degree:** Bachelor | | | | |
| **Code** | **Year/Semester** | **Local Credits** | **ECTS Credits** | | **Course Implementation, Hours/Week** | | | | |
| **Course** | | **Tutorial** | | **Workshop** |
| **MTE 004S** | **2/1 (Autumn)** | **2** | **5** | | **1** | | - | | **1** |
| **Department** | | **Maritime Transportation Engineering** | | | | | | | |
| **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 | | 50 | | - | | 30 | |
| **Course Description** | | This unit introduces the learner to the use of a sextant and chronometer to obtain the time of observation and the observed altitude of celestial bodies including the calculation of a ship’s position by celestial observations. It is primarily aimed at learners who intend to seek sea-going employment as a Merchant Navy Deck Officer. | | | | | | | |
| **Course Objectives** | | To educate and train trainees as a deck officer and ultimately as a captain of the merchant vessel, on the subjects of; universe, solar system, celestial sphere, celestial coordinate system, hour angle, daily movements of the celestial bodies, finding and calculating the coordinates of celestial bodies, time, usage of sextant and other celestial instruments, their errors and corrections. | | | | | | | |
| **Course Learning Outcomes** | | Trainees passing the course successfully will acquire knowledge and skills as listed below and will be able to.   1. Describe universe and solar system and apply celestial coordinates for celestial navigation purposes 2. Use time concept and calculate zone time and local mean time for celestial calculations 3. Interpret interrelationship of the terrestrial, celestial, and horizon coordinate systems 4. Use documents regarding astronomical movements of celestial bodies and solutions to obtain celestial fix 5. Use nautical instruments precisely regarding celestial navigation. | | | | | | | |
| **Instructional Methods and Techniques** | | Lecturing and Simulator Studies | | | | | | | |
| **Tutorial Place** | | Classroom and Simulator | | | | | | | |
| **Co-term Condition** | | **---** | | | | | | | |
| **Textbook** | | Unit Handout, Power Point Slides  Bowditch, N. The American Practical Navigator. Defence Mapping Agency | | | | | | | |
| **Other References** | | Art of Celestial Navigation, Şems AKTUĞ | | | | | | | |
| **Homework & Projects** | | Each group will prepare simple passage planning which will be used during simulator exercise as directed by the lecturer. | | | | | | | |
| **Laboratory Work** | | Simulator Exercise | | | | | | | |
| **Computer Use** | | Bridge and ARPA Radar simulators and Stand Alone Computers simulator (for LO 4 and 5), 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 | **1** | **30** |
| Quiz | **2** | **20** |
|  |  |  |
| Term Paper/Project |  |  |
| Laboratory Work |  |  |
| Practices |  |  |
| Tutorial |  |  |
| Seminar |  |  |
| Presentation |  |  |
| Field Study |  |  |
| Final Exam | **1** | **50** |
| **TOTAL** |  | **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 | **7** | **2** | **14** |
| Midterm | **1** | **10** | **10** |
| Quiz | **2** | **5** | **10** |
| Homework | **2** | **10** | **20** |
| Term Paper/Project |  |  |  |
| Laboratory Work |  |  |  |
| Practices | **7** | **5** | **35** |
| Tutorial | **7** | **2** | **14** |
| Seminar |  |  |  |
| Presentation | **7** | **2** | **14** |
| Field Study |  |  |  |
| Final Exam | **1** | **10** | **10** |
| **Total Workload** |  |  | **127** |
| **Total Workload/25** |  |  | **127/5** |
| **Course ECTS Credits** |  |  | **5** |

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| **Week** | **TOPICS** | **Course Outcomes** |
| **1** | **Universe;** Solar System, Sun, Planets, Earth, Moon, Stars, Magnitude, Apparent motion, Ecliptic, Celestial Symbols.  *(Use Stellarium or* [*https://www.solarsystemscope.com*](https://www.solarsystemscope.com)*)* | I |
| **2** | **Time and the Calendar;** From a navigational standpoint, Solar, lunar day and time,  **Time and Arc,** Time zones, UTC, ZD, ZT, LMT, International Date Line, radio dissemination of time signals. | II |
| **3** | **Coordinate systems**; Terrestrial, celestial and horizon coordinate systems, interrelationships of the terrestrial, celestial, and horizon coordinate systems in defining the celestial and navigational triangles*.*  *(Use Stellarium or KONGSBERG’s K-Sim Navigation simulator)* | I-III |
| **4** | **Celestial coordinate system;** The celestial sphere with the earth as the perceived center of the universe, Geodesy, Circle of equal altitude, The equinoxes and solstices, Hour angle, declination, altitude, Greenwich hour angle (GHA), Local hour angle (LHA), Stars and the first point of Aries, Sidereal hour angle (SHA) *(Use Stellarium or KONGSBERG’s K-Sim Navigation simulator for explaining the terms)* | III |
| **5** | **Horizon coordinate system:**  Azimuth, azimuth angle, horizon, altitude) (Use Stellarium) | III |
| **6** | **Almanac;** Parts of almanac, Usage, finding GHA, LHA, SHA.  Compass Error by Azimuth of the Sun, Compass Error By Azimuth Of Polaris. **Quiz** | I-II-III |
| **7** | **Identify stars and planets on a celestial sphere** | III-IV |
| **8** | **Instruments for celestial navigation:**  General description | III-IV |
| **9** | **Instruments for celestial navigation**, **Sextant**, Optical Principles of a Sextant and parts, taking sight, Non-Adjustable and adjustable Sextant Errors, Reading the Sextant, Care of the Sextant, Artificial Horizon,  *(****Each trainees should have a sextant)*** | I-II-III-IV |
| **10** | **Observation by sextant and corrections**; measurement of angles and altitudes of celestial bodies (e.g. Trainees passing the course successfully will acquire knowledge and skills as listed below and will be able to. observations of the sun, stars and planets), Index errors, DIP, Sextant Altitude, Apparent Altitude, Horizontal – Parallax Correction, Observed Altitude.  *(****Each trainees should have a sextant)*** | V |
| **11** | **Sextant Practice Marine *Chronometer***: take and record time readings (e.g. in navigational calculations); handling and care (e.g. storage, monitoring of error rate); identification of errors (e.g. time signals, compass error log), **Watches**, Navigational **Calculators** and **Software. *(Sextant practice at outdoor, or use laser pointer as a star in class room)*** | III-IV-V |
| **12** | **Set and rise Sun**  ***(Use*** [***https://www.skymarvels.com***](https://www.skymarvels.com) ***or Stellarium)*** | III-IV-V |
| **13** | **Set and rise Moon**  ***(Use Stellarium)*** | VI |
| **14** | **Review and practical problem solutions** | I-II-III-IV-V |

**Relationship between the Course and the Curricula of Maritime Transportation Engineering**

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|  | **Program Outcomes** | **Level of Contribution** | | |
| **1** | **2** | **3** |
| **a** | An ability to apply knowledge of mathematics, science, and engineering |  |  | X |
| **b** | An ability to design and conduct experiments, as well as to analyse and interpret data |  | X |  |
| **c** | An ability to design a system, component or process to meet desired needs |  | X |  |
| **d** | Ability to function on multi-disciplinary teams |  |  | X |
| **e** | An ability to identify, formulate, and solve engineering problems |  |  |  |
| **f** | An understanding of professional and ethical responsibility |  | X |  |
| **g** | An ability to communicate effectively | X |  |  |
| **h** | The broad education necessary to understand the impact of engineering solutions in a global and societal context |  |  |  |
| **i** | A recognition of the need for, and an ability to engage in life-long learning |  |  | X |
| **j** | A knowledge of contemporary issues |  |  | X |
| **k** | An ability to use the techniques, skills and modern engineering tools necessary for engineering practice |  |  |  |
| **l** | An ability to apply legal, societal and environmental knowledge in maritime transport and in all respective modes of transport operations. | X |  |  |
| **m** | An ability to interpret and analysis of the data regarding maritime management and operations, recognition and solution of problems for the decision-making process. | X |  |  |

**1: Small, 2: Partial, 3: Full**

**Program Outcomes & Course Outcomes Connectivity Matrix**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course**  **Outcomes** | **I** | **II** | **III** | **IV** | **V** |  |  |
| **Program Outcomes** |
| **a** |  |  |  |  |  |  |  |
| **b** |  |  |  |  |  |  |  |
| **c** |  |  |  |  |  |  |  |
| **d** |  |  |  |  |  |  |  |
| **e** |  |  |  |  |  |  |  |
| **f** |  |  | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  |
| **g** |  |  | |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  |  |
| **h** |  |  |  |  |  |  |  |
| **i** |  |  |  |  |  |  |  |
| **j** |  |  | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  |
| **k** |  |  | |  |  | | --- | --- | |  |  | |  |  |  |  |
| **l** |  |  | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  |
| **m** |  |  |  |  |  |  |  |

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| ***Prepared by*** | **Date** | Signature |