

## Navigational Aids

Basic Course Specification					
Course Title	Course Code	Program on which the course is given			
Navigational Aids	BS 262	Bachelor			
Academic Year	Specialization (units of study)	Pre-Requisites			
2020-2021	Theoretical (2 hrs/week) Application (2 hrs/week) Credit 3Cr	BA112 N			
Overall Course Objectives					
On completion of this course, students should be competent to understand the information about the generic use of Electronic Systems of Position Fixing and Navigation covers the requirements of the STCW convention Chapter II, Table A-II/I of STCW Code., Provides the students with the detailed knowledge to support the training outcomes related to Navigation at the operational level.					
Course Learning Outcomes. By successful completion of the course each student will be able to:					
Topic	Linking to PLOs	Midterm Assessment	12 <sup>th</sup> Week Assessment	Class Activities	Final Exam
1. Understand the principles and generic use of Electronic Systems of Position Fixing and navigation to maintain safe navigation.	a,b	√			√
2. Understand the components and use of echo sounder and speed log.	a			√	√
3. Identify the limitation of electronic navigation equipment when using them.	a	√	√		
4. Determine ships position using electronic systems of positions.	a		√	√	
5. Use of AIS to maintain safety of navigation.	a			√	√
Course Content					
Lec./ Week #	Topic	Hrs. #	Theoretical	Application	
1	Introduction to Electromagnetic waves and Electronic Navigation. Basic Principles of Hyperbolic Navigation Systems.	4	2		
2	Loran-C System – the basic of loran c system, ambiguity in a position. Loran-C System – third-cycle matching, loran charts and chain selection.	4	2		
3	Introduction to Global Navigation Satellite System (GNSS) The principles of operation of Global Navigation Satellite Systems. GPS System – The basic principles of the Global Positioning System (GPS).	4	2		

4	GPS System – the system configurations; GPS space segment. GPS System – the system configurations; operational control segment (OCS), and user`s segment.	4	2	2
5	GPS System – GPS satellite Signals; structure, the frequencies used, C/A & P codes. GPS System – GPS satellite Signals; structure: pseudo range measurement, and navigation message.	4	2	2
6	GPS System – the various errors of GPS; ranging errors, DOP and GPS positioning services; PPS, SPS. GPS System – GPS Modernization; upgrading the control segment, upgrading the space segment and the intended level of accuracy after modernization. GPS System – WGS-84, datum shifts, and the advantages / limitations of GPS.	4	2	2
<b>7</b>	<b>Demonstrates and Operates a GPS receiver.</b> <b>7<sup>th</sup> Week Exam</b>	<b>4</b>	<b>2</b>	<b>2</b>
8	GLONASS system – the system configurations, satellite signals, and time, coordinate reference, combined GPS/GLONASS receiver equipment.	4	2	2
9	GALILEO System – the system configuration; system segments, status, and Services + DGPS – DGPS concept, correction method, local-area, wide-area, accuracy, the limitation of DGPS Receiver, and case studies.	4	2	-
10	e-Loran – basic operating principles, difference between e-Loran and traditional Loran-c, system users, the control operating and monitoring systems, and advantages and limitations of e-Loran.	4	2	2
11	Echo Sounder - The characteristics of sound in sea water, the basic principles of marine echo-sounding equipment. Echo Sounder - components, methods of appearing the measurable depth. Echo Sounder - the transducer and Errors.	4	2	2
12	Operates the echo sounder and demonstrates basic maintenance. 12th Week Exam	<b>4</b>	<b>2</b>	<b>2</b>
<b>13</b>	Speed logs - Doppler speed log; Doppler shift, the basic principles of the Doppler speed log. Speed logs - Doppler speed log; the Janus configuration to counteract the effect of ship`s trim, the dual-axis configuration and its use, the main error sources on the various types of logs, and calibration.	4	2	2
<b>14</b>	Automatic Identification System (AIS) - AIS concept, AIS data. Voyage Data Recorder (VDR) – Purpose of VDR, components of VDR Operates speed logs, AIS and VDR	4	2	2
15	General revision	4	2	2
<b>16</b>	<b>Final Assessment</b>			
<b>Total Hours</b>		<b>60</b>	<b>30</b>	<b>30</b>

Teaching & Learning Methods		Facilities Required for Teaching & Learning Methods	
<ul style="list-style-type: none"> <li>Explaining and demonstrating the lesson contents – Delivery of experience - discussing and asking questions to interact with students – solving examples.</li> </ul>		<ul style="list-style-type: none"> <li>Whiteboard&amp; Data Show</li> <li>Bridge Simulator.</li> </ul>	
Students Assessment Methods			
Assessment Schedule			
Assessment#1		Week 7	
Assessment#2		Week 12	
Assessment#3		Week 16	
Grading Method			
Midterm Assessment	Written exam	30%	
12 <sup>th</sup> week Assessment	Written exam	20%	
Class Activities	Participation - Quiz	10%	
Final Exam	Written exam	40%	
		<b>Total</b>	<b>100 %</b>
<p align="center"><b>Assessment criteria shall meet the standards of the STCW 78 convention "as amended"; and in the light of the related IMO model courses.</b></p>			
List of References			
Course Notes		Essential Books	
Navigational Aids handout, College of Maritime Transport and Technology, AAST&MT, Alexandria, 2019 edition.		ELECTRONIC NAVIGATION SYSTEMS ISBN 9780750651387	
Recommended Books		Periodicals and Publications	
<ul style="list-style-type: none"> <li>Tetley, L. and Calcutt, D. Electronic Navigation Systems, 3rd ed. ELSEVIER Butterworth, London, 2011.</li> <li>Lowns borough, R. and Calcutt, D. Electronic Aids to Navigation: Radar and ARPA 1 st ed. London, Edward Arnold, 1993. (ISBN 0-340-59258-3)</li> <li>Toft, H. GPS Satellite Navigation. Stoevring, SHIPMATE, Rauff and Sorenson Ltd (Oestre Aile 6, DK-9530 Stoevring, Denmark, 1987. (ISBN 87-982698-3-6)</li> </ul>		<p align="center">None</p>	
Others (websites, e-books...etc)			
<ul style="list-style-type: none"> <li>International Convention on Standards of Training, Certification and Watch keeping for Seafarers 78(STCW), as amended.</li> <li>International Convention for the Safety of Life at Sea 1974(SOLAS), as amended latest edition-2020</li> <li>Assembly Resolution A.224 (VII) - Performance Standards for Echo-Sounding Equipment.</li> </ul>			

- Assembly Resolution A.478 (XII) - Performance Standards for Device to Indicate Speed and Distance (“Amended by A.824(19)”), Assembly Resolution A.824(19) - Performance standards for devices to indicate speed and distance.
- Assembly Resolution A.953 (23) - World-wide radio navigation system.
- Assembly Resolution A.577 (14) - Operational Status of Electronic Position-Fixing Systems.
- Resolution A.917 (22), Guidelines for the on-board operational use of ship borne Automatic Identification Systems (AIS).
- Resolution MSC.74 (69), Annex 3, Recommendation on performance standards for a universal Ship borne Automatic Identification System (AIS).

#### Accreditation Bodies

- \*Egyptian Authority for Maritime Safety (EAMS)
- \*European Commission (EC)
- \*ISO (9001 – 2015) DNV-GL\*
- \*Central Evaluation and Accreditation Agency Hanover, Germany (ZEVA)
- \*Ministry of Education (KSA)
- Ministry of Higher Education (Greece)\*
- \*Ministry of Higher Education (Oman)
- \*Commission for Academic Accreditation (CAA), Ministry of higher Education (UAE)
- \*University of Plymouth, United Kingdom (dual degree)

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