

MT3224 – Electronic Chart Display and Information Systems Syllabus

INSTRUCTORS:

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Office Hours

Wednesdays 0900-0950

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***Or by mutual appointment

Course Description:

This course provides the generic knowledge, skill and understanding of ECDIS needed to safely navigate vessels whose primary means of navigation is ECDIS. The course is based on the IMO model course 1.27 (40 hours duration) for bridge officers to satisfy the IMO Standards for Training Certification and Watch Keeping (STCW). Course content covers the theory and practical use of ECDIS, IMO regulations and Performance Standards governing the use of ECDIS.

IMO Definition of Generic ECDIS Training

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“ECDIS training to ensure that navigators can use and understand ECDIS in the context of navigation and can demonstrate all competencies contained in and implied by STCW 2010. Such training should ensure that the navigator learns to use ECDIS and can apply it in all aspects of navigation, including the knowledge, understanding and proficiency to transfer that skill to the particular ECDIS system(s) actually encountered on board, prior to taking over navigational duties. This level of training should deliver the competencies at least equivalent to those given in Model Course 1.27”.

Scope:

This course in the operational use of Electronic Chart Display and Information Systems (ECDIS) is designed to enhance the safety of navigation by providing the knowledge and skills necessary to utilize the features of ECDIS. The training and assessment incorporate the use of live marine ECDIS equipment networked with the instructor and with visual bridge simulators.

Objective:

Those who successfully complete this course should be able to demonstrate sufficient knowledge, skill and understanding of generic ECDIS navigation and electronic charts to undertake the duties of a navigational watch officer defined by STCW Code.

Trainees will become proficient in operating ECDIS equipment in a navigational context. Guided by task performance measures and standards through each lesson and exercise, and formal simulation evaluation, trainees will demonstrate skills in:

- Use, installation and correction of electronic charts
- Configuration of ECDIS data
- Validity of sensor data (including radar overlay)
- Potential errors of interpretation
- Selecting operation settings and alarms for route monitoring
- Navigational calculations, position fixing
- Selecting safety parameters
- Route planning, passage planning, and monitoring.
- Accessing ship’s log and data playback functions
- ARPA and AIS functions
- Tides and currents

Course Format

The course is presented in a one hour lecture and two hour hands on simulation format per week for a fifteen week semester. Each lecture will present knowledge based information necessary for understanding the proper use of ECDIS. The labs build on this theory with sophisticated navigation simulation that provides each trainee with individual unshared access to ownship operations integrated with a complete type-approved ECDIS.

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Learning Objectives

Assessments

Each individual will demonstrate their knowledge and understanding of ECDIS and electronic navigation charts (ENC's) and the following STCW elements through practical demonstration and written examination:

- [OICNW-A4.1](#) thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats
- [OICNW-A4.1](#) the dangers of over-reliance
- [OICNW-A4.1](#) familiarity with the functions of ECDIS required by performance standards in force
- [OICNW-A4.2](#) use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings
- [OICNW-A4.2](#) safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)
- [OICNW-A4.2](#) confirmation of vessel position by alternative means
- [OICNW-A4.2](#) efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements
- [OICNW-A4.2](#) adjustment of settings and values to suit the present conditions
- [OICNW-A4.2](#) situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors

Each individual will demonstrate their proficiency, skill and understanding of ECDIS and electronic navigation charts (ENC's) by demonstrating of the following practical skills as per STCW performance requirements:

- [OICNW-3-3A](#) Operational Settings - Safety Depth
- [OICNW-3-3B](#) Operational Settings - Display/Change Safety contour
- [OICNW-3-3C](#) Operational Settings - Display/change CPA/TCPA limits
- [OICNW-3-3D](#) Operational Settings - Display/Change spot sounding limits
- [OICNW-3-3E](#) Operational Settings - Resume of Navigation Mode
- [OICNW-3-3F](#) Monitoring Sea Area - Chart Scaling
- [OICNW-3-3G](#) Monitoring Sea Area - Chart selection
- [OICNW-3-3H](#) Monitoring Sea Area - Gain information
- [OICNW-3-3I](#) Monitoring Sea Area - ERBL

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- [OICNW-3-3J](#) Display User Charts
- [OICNW-3-3K](#) Merge User Charts
- [OICNW-3-3L](#) Display Route Plans
- [OICNW-3-3M](#) Modify Waypoints
- [OICNW-3-3N](#) Check revised route for safety
- [OICNW-3-3O](#) Convert Route Plan to Passage Plan
- [OICNW-3-3P](#) Convert Route Plan to a Route
- [OICNW-3-3Q](#) Environmental Data - Identify tidal data
- [OICNW-3-3R](#) Environmental Data - Display tide bars and current vectors

Class Limitations:

Maximum Class Size (Simulation): 8

Maximum of 1 per work station

Staff requirements: 1 approved instructor per class

Prerequisites

MT-3222 ARPA, minimum grade (C-)

Required Text

ECDIS Basics, by Ralph Becker Heins, published by GeoMares

Additional Resource

Horst Hecht, Lee Alexander, **The Electronic Chart** 2011.

Facilities:

ECDIS Simulator: Transas NaviSailor 4000 ECDIS MFD, Bresnahan 213

Classroom: Section 16 - H104, Section 22 - H201

Teaching Aids:

Visual Aids: Projector, white board, software files, printed handouts, Student Guide, and ECDIS equipment and user manuals.

Exams and Grading

Lecture 50%

3 Quizzes – 25 % each

Final exam – 25 %

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Simulation 50%

Assessments – A midterm practical exam on the use of ECDIS and a comprehensive final exam will cover the STCW assessments and determine your semester grade for the simulation portion of the class. It is possible to pass an exam but not pass/complete an imbedded STCW assessment. Should you not pass the required assessments you will be provided a second opportunity to retake that individual assessment. If you do not pass incomplete assessment(s) during your second attempt you will be issued a course grade of “Incomplete”. It will be your responsibility to see your instructor and schedule a date and time for your third opportunity to pass any outstanding assessments. Failure of any assessments on your third attempt and/or not completed by the second week of the 2022 fall academic semester will result in a failure of the course.

Attendance

Attendance is mandatory for all lab and class periods. This is an STCW regulated course requiring 40 hours of training. The course meets only once per week for one hour of theory and two hours per week for simulation. Each student is allowed only one absence throughout the semester. *Missing more than one class and one lab will result in a failure to meet STCW requirements and the student will be asked to withdraw from the course.*

Documented Disability

Massachusetts Maritime Academy is committed to providing reasonable accommodations to students with documented disabilities. Students who believe they may need accommodations in this class are required to contact Dr. Elaine Craighead within the first two weeks of class. ecraighead@maritime.edu.

Note: Accommodations will be granted for knowledge based performance measures but WILL NOT be granted for all skill and practical performance based assessments.

Successful completion of this course is determined by you the student. Do not fall behind, do the reading, ask questions when in doubt, and report to class ready to work and learn. The simulation lab will be open once per week for in the evening (TBD) for skills practice. It is highly recommended you take advantage of this time as practice is necessary to become proficient. Our mutual goal for this course is for each of you to enhance your professional watch standing knowledge and become a highly skilled licensed Third Mate in the U. S. Merchant Marine. I look forward to working with you this semester.

Student Expectations:

Come to class ready to learn and train – Asking questions, taking notes, and doing the assigned reading and homework will help give you the best understanding of ECDIS and assist you in

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passing this course. Students are expected to bring the required text book, *ECDIS BASICS* by Ralph Becker-Heins, to class every day. Students will stay off cell phones and/or electronics devices that will distract both students and instructor.

ECDIS is a complex piece of equipment that encompasses concepts from Coastal Nav 1 & 2, RADAR/ARPA, AIS, and COLREGS. Having an in depth understanding of the theory of ECDIS and operational use will GREATLY contribute to you standing a safe and competent watch.

My job is to educate you. As such, students can expect the professor to act professional, prepare material, and format lesson plans accordingly. ECDIS can be a complicated piece of equipment both in theory and operation. *If you need help - office hours are available during listed hours and/or by appointment.*

“YOU CAN HAVE A MERCHANT MARINE WITH FIRST CLASS MEN AND WOMEN
EVEN IF THEY SAIL SECOND CLASS SHIPS. BUT SECOND-CLASS MEN AND
WOMEN CAN’T BE TRUSTED ON THE FINEST SHIPS AFLOAT”.

*Joseph P. Kennedy, Chairman
Federal Maritime Commission
May 1937*

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LECTURE SYLLABUS

TOPIC	READING/HOMEWORK
<p>1. Introduction - Elements of ECDIS, Training</p> <ul style="list-style-type: none"> a. Introduction to ECDIS b. Purpose of ECDIS c. ECDIS value to navigation d. Limitations of ECDIS: Correct and Incorrect use of ECDIS 	Chapter 1,4
<p>2. A. Carriage Requirements</p> <ul style="list-style-type: none"> a. SOLAS Chapters V, Regulations 19, 27 b. Flag State Requirements <p>2. B. Functionality Requirements</p> <ul style="list-style-type: none"> a. Performance Standards b. Power supply c. Back up d. Software upgrade e. Official ENC charts f. Type Approval 	Chapter 2,3 Chapter 2,3
<p>3. Sensor Requirements</p> <ul style="list-style-type: none"> a. Required sensors b. Sensor selection c. Primary and Secondary position source d. Sensor alarms e. Sensor reference point f. Own ship presentation g. Own ship vectors COG/HDG h. Predicted vectors i. Past history 	Chapter 10

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<p>4. Chart Data</p> <ul style="list-style-type: none">a. Official and unofficial chart datab. Types of charts, Vector/Rasterc. ENCd. SENCe. Chart objects, understanding chart dataf. Chart Standards, Data format, presentation libraryg. Characteristics of a vector charth. Chart numbering, scalingi. Chart selectionj. Chart quality and accuracy	Chapters 5, 8
<p>5. Chart Presentation</p> <ul style="list-style-type: none">a. Automatic chart loadingb. Chart selectionc. Chart orientationd. Own ship movemente. Overscaling and underscalingf. Base, Standard, All, Custom Display modesg. SCAMINh. Primary/Secondary Displayi. Safety contourj. Safety depthk. Depth shades – 2 depth shades, 4 depth shadesl. Required Alarms/Indications	Chapters 6,13

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<p>6. Target Presentation</p> <ul style="list-style-type: none"> a. Radar Overlay (RIB functions) b. Radar targets c. AIS Targets – target symbol features d. ARPA targets– target symbol features e. AIS, ARPA Set up requirements f. AIS, ARPA Alarms 	Chapter 6
<p>7. Voyage/Route Planning</p> <ul style="list-style-type: none"> a. Waypoints, creation, labeling b. Construction a draft route c. Waypoints, refining/adjusting d. Visual route check 	Chapters 11,13
<p>8. Voyage/Route Planning cont’</p> <ul style="list-style-type: none"> e. Voyage plan creation f. Voyage plan auto route check g. Route planning Indications/warnings h. ETA’s, CN, Dist. i. Naming and saving the voyage plan j. Loading/unloading voyage plan k. Route monitoring Activated State l. Alarms/Indications m. Tide, current, port information 	Chapters 11,13
<p>9. Effective Navigation With ECDIS</p> <ul style="list-style-type: none"> a. Potential errors b. Errors of interpretation c. System errors d. EBL/VRM e. Lines of Position/Position fixing f. User additions to chart g. Event Marker/MOB function 	Chapter 7,14

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<p>10. Chart Licensing, Distribution, Maintenance</p> <ul style="list-style-type: none"> a. License b. Installation procedures c. Format requirements d. Data distribution sources for ENC and conversion to SENC e. Chart installation history 	Chapter 9
<p>11. Installing Chart Corrections</p> <ul style="list-style-type: none"> a. Maintaining up to date charts b. Automatic chart corrections c. Manual chart corrections d. Chart update history e. Temporary and preliminary corrections and warnings 	Chapter 9

Simulation Syllabus

WEEK	TOPIC
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1	<p>Navigation Bridge Familiarization - Each student will be familiarized with the navigation and operating equipment available in each simulated navigation bridge. Students will initialize each piece of equipment and be instructed in its location and use where the simulated equipment differs from actual equipment. Operation of the ECDIS mouse and keyboard functions. This exercise will familiarize the student with the mouse driven, Information Panel Soft Tabs and Keyboard driven functions of the ECDIS. The student will begin using the Task List to configure their chart information and data display. Students will be shown how to set up the EDCIS Palette and Skin display for optimum viewing in various lighting conditions.</p>
2	<p>Task List functions CONFIGURATION & MONITORING - Each student will be initialize and set up the bridge navigation and operation equipment. They will CONFIGURE the ECDIS per the instructor’s requirements. Students be instructed in the use of the Task List function “MONITORING”. They will set route monitoring safety parameters and make use of the various symbols pertinent to safe route monitoring and navigation. Safety and Navigation alarms will be set and monitored for the specific geographic area. Each student will observe the difference and practice changing chart display modes from Basic to Standard and Custom.</p>
3	<p>Task List function “CHARTS” - Each student will initialize and set up the bridge navigation and operation equipment. They will configure the ECDIS per the instructor’s requirements. Students be instructed in the use of the Task List function “CHARTS” and learn how to groom the ECDIS for best user data and screen display. They will set route monitoring safety parameters and make use of the various symbols pertinent to safe route monitoring and navigation. Safety and Navigation alarms will be set and monitored for the specific geographic area. Each student will observe the difference and practice changing chart display modes from Basic to Standard and Custom.</p>
4	<p>Route Planning (1) - This exercise will familiarize the student with the principles of electronic voyage planning. Guidelines of voyage planning, route appearance on the ECDIS, route planning parameters will be covered. Students will create, modify, name, save and activate a route determining the ETA for required points along the route. Safety checks both visually and automated will be covered.</p>
5	<p>Route Planning (2) - This exercise will familiarize the student with the principles of electronic voyage planning. Guidelines of voyage planning, route appearance on the ECDIS, route planning parameters will be covered. Students will create, modify, name, save and activate a route determining the ETA for required points along the route. Safety checks both visually and automated will be covered. The students will also learn Route Scheduling and Merging User Charts.</p>

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6	<p>Exam #1 – Use of mouse and keyboard, ERBL, Gain Information, Route Planning. Each student will be initialize and set up the bridge navigation and operation equipment. They will configure the ECDIS per the instructor’s requirements. Students be instructed in the use of the Task List function “NAVIGATION”. They will set the Primary and Secondary EPFS source fed into the ECDIS. Students will determine Heading Input either Gyro or Magnetic and apply appropriate gyro error or magnetic variation to correct compasses to true. Additionally Speed and Depth input sources will be determine and inputted by the student. Students will create a route.</p>
7	<p>CHART OVERLAYS - Students will learn how to select radars and use radar settings to properly adjust the radar display overlaid on the ECDIS chart display. External ARPA display of targets will be imported onto the ECDIS radar and chart display. Students will view the different symbols used to designate active and dangerous ARPA targets. Students will learn how to turn on/off the display of AIS targets on the ECDIS chart display and view symbols used to designated active, sleeping and dangerous AIS targets. The various display of AIS target Identifiers will be discussed and demonstrated.</p>
8	<p>Route Planning (3) Converting Route Plan to a Passage Plan, Scheduling, Merging, and Reversing Routes – The students will learn how to create a Route Schedule, ETA’s and Speed required. They will Merging and Reversing User Routes and convert their Route Plan to a Passage Plan by incorporation of environmental data including Tides and Currents along with identifying Tidal Stations and Current Direction and Velocity Vectors. Students will convert their Passage Plan to an active Monitored Route.</p>
9	<p>Chart Corrections, User Maps - Students will make required Manual Corrections and optional but important user information in MAPS to the ENC, Delete and Restore Objects and edit Point, Line, Area and Circle Objects.</p>
10	<p>Licensing, chart ordering - Students will learn about Licensing, Ordering and Downloading ENC charts and Portfolio’s using the ECDIS Chart Assistant.</p>
11	<p>Underway Practice</p>
12	<p>Exam #2 - STCW Practical Assessment Exam</p>