

COURSE PACKAGE

Part A: Course Specifications

Course Code	: ICT			
Course Descriptive Title	: Maritime Information Communication and Technology with Cyber Security			
Prerequisite	: None		Corequisite	: None
Year Level	: First Year		Semester Offered	: First Semester
Course Credits	: 2 units	Theoretical Contact Hours Per Week	: 1 hour	Demonstration/Practical Work Contact Hours Per Week : 3 hours
Course Description	: This course introduces the fundamentals of maritime ICT technologies and systems. It includes topics on the introduction to computer systems, computer hardware and storage devices, basic computer hardware and software servicing with troubleshooting, Software Productivity Tools, Data Communication and Computer Networks, Cyber Security and Emerging Technologies – Fourth Industrial Revolution. The students of this course are going to be immersed in interactive discussions as well as various activities and demonstrations. By the end of the course, the students are expected to be able to effectively use computer devices in shipboard application and contribute to managing cyber security. Written and practical assessments are conducted to ensure the attainment of the required outcomes.			
STCW Reference	STCW Table	Function	Competence	Knowledge, Understanding and Proficiency
	N/A	N/A	N/A	N/A
Course Outcomes		CO1. Use computer in word processing, presentation graphics, spreadsheet, internet, email and other onboard applications CO2. Distinguish the different computer networks found on board in terms of their set-up, purposes and capabilities CO3. Build a small-scale wired local area network with a common shared folder CO4. Interpret cyber-security risk management plan for shipboard and shore application		
	PO-B.1 PO-B.3 PO-A.1 PO-B.2	CO5. Identify the social and economic impacts of emerging technologies in maritime ICT		

Course Intake Limitations	: The number of students that can be accommodated shall not exceed 40 for lecture and 20 for laboratory.
Faculty Requirement	<p>Instructor: The faculty that will be assigned to handle the course must possess the following qualifications:</p> <ul style="list-style-type: none"> • Graduate of any IT related program with units earned in Masters' Degree in IT (related program); • completed Training Course for Instructors (IMO Model Course 6.09); • completed Training Course on Assessment, Examination and Certification of Seafarers (IMO Model Course 3.12); • knowledgeable with computer hardware, software and networks; and • preferably with teaching experience. <p>Assessor: The assigned assessor to conduct the assessment for this course shall have the same qualification for the instructor as outlined above.</p>
Teaching Facilities and Equipment	<p>CLASSROOM The standard classroom size shall be a minimum of 48 square meters, no side shall be less than 6 meters for a class of 40 students. Classroom must be well-lighted and well-ventilated. It should contain the following:</p> <ul style="list-style-type: none"> • Tables and chairs or armed chairs • Whiteboards or chalkboards • Multimedia equipment <p>COMPUTER LABORATORY</p> <ul style="list-style-type: none"> • Computer hardware and software – including system software and application software • Computer networking peripherals • Computer workstations (preferably connected by LAN) <p><i>Note:</i></p> <ol style="list-style-type: none"> 1. Computer laboratory may be used for lecture activities. 2. The MHEIs may use additional teaching facilities and equipment as deemed necessary to meet the learning outcomes of this course.
Teaching Aids	<p>A1 PPT presentation A2 Whiteboard, marker and handouts A3 Computer component or devices A4 Microsoft Office (or equivalent)</p> <p><i>Note: The MHEIs may use additional teaching aids as deemed necessary to meet the learning outcomes of this course.</i></p>
References / Bibliographies	<p>References:</p> <p>R1 International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended R2 IMO Resolution MSC.428(98) – Maritime cyber risk management in Safety Management Systems</p>

- R3** IMO MSC-FAL.1/Circ.3 – Guidelines on maritime cyber risk management
- R4** IMO Resolution MSC.64(67) – Adoption of new and amended performance standards, Annex I – Recommendation on performance standards for Integrated Bridge Systems (IBS)
- R5** IMO MSC/Circ.891 – Guidelines for the on-board use and application of computers
- R6** IACS Rec. No. 156 – Network Architecture
- R7** NIST Special Publication 800-82 (Revision 2) – Guide to Industrial Control Systems (ICS) Security
- R8** BIMCO, CLIA, ICS, Intercargo, InterManager, INTERTANKO, IUMI, OCIMF and World Shipping Council (2020). *The Guidelines on Cyber Security Onboard Ships* (Ver. 3). Retrieved from <https://www.ics-shipping.org/wp-content/uploads/2020/08/guidelines-on-cyber-security-onboard-ships-min.pdf>.

Bibliographies:

- B1** Williams, B., & Sawyer, S. (2015). *Using Information Technology* (11th ed.). New York City: McGraw Hill.
- B2** Liptak, B. G., & Eren, H. (Eds.). (2012). *Instrument Engineer's Handbook: Process Software and Digital Networks* (Fourth ed., Vol. III). Boca Raton, Florida: CRC Press.

Websites:

- W1** Microsoft Learn. URL: <https://docs.microsoft.com/en-us/learn/>
- W2** Usability.gov. *User Interface Elements*. Retrieved from <https://www.usability.gov/how-to-and-tools/methods/user-interface-elements.html>
- W3** Microsoft Learn. *Outlook training*. Retrieved from <https://support.microsoft.com/en-us/office/outlook-training-8a5b816d-9052-4190-a5eb-494512343cca>
- W4** Microsoft Learn. *Word for Windows training*. Retrieved from <https://support.microsoft.com/en-us/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847eae73>
- W5** Microsoft Learn. *Excel video training*. Retrieved from <https://support.microsoft.com/en-us/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb>
- W6** Microsoft Learn. *PowerPoint for Windows training*. Retrieved from <https://support.microsoft.com/en-us/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-bd53d3398787>
- W7** Microsoft Learn. *Access video training*. Retrieved from <https://support.microsoft.com/en-us/office/access-video-training-a5ffb1ef-4cc4-4d79-a862-e2dda6ef38e6>

Academic Papers, Journals and Dissertations:

- P1** Dr. Stopford, M. (2020). *Coronavirus, Climate Change & Smart Shipping – Three Maritime Scenarios: 2020 – 2050*. Seatrade Maritime, URL: <https://www.seatrade-maritime.com/ship-operations/whitepaper-coronavirus-climate-change-smart-shipping-three-maritime-scenarios-2020>
- P2** Chou, L. D., & Juang, J. Y. (1996). *Network-Integrated Ship Automatic System and Internetworking to the Internet*. *Journal of Marine Science and Technology*, 4(1), 35-41.
- P3** Markus Fruth & Frank Teuteberg | Shaofeng Liu (Reviewing Editor) (2017) *Digitization in maritime logistics—What is there and what is missing?*, *Coigent Business & Management*, 4:1, DOI:

<https://doi.org/10.1080/23311975.2017.1411066>

- P4** Junkeon Ahn, Tae-Hwan Joung, Seong-Gil Kang & Jongkap Lee (2019) Changes in container shipping industry: Autonomous ship, environmental regulation, and reshoring, Journal of International Maritime Safety, Environmental Affairs, and Shipping, 3:3-4, 21-27, DOI: <https://doi.org/10.1080/25725084.2019.1678564>

Note: The MHEIs may use additional references/bibliographies as deemed necessary to meet the learning outcomes of this course.



Part B: Course Outline and Timetable

Term	Week	Topic	Time Allotment (in hours)	
			Theoretical	Demonstration/ Practical Work
<i>Note: MHEIs shall determine the number of periods or terms the semester is divided based on their school calendar of activities such as Prelim, Midterm, and Final.</i>	1	1. Introduction to Computer Systems 1.1 Main components of computer system – Hardware and software 1.2 Types of computers 1.3 CPU and GPU 1.4 Operating and application systems	1	3
	2	2. Computer Hardware and Storage Devices 2.1 Input devices 2.2 Output devices 2.3 Input/output devices issues 2.4 Cache memory 2.5 Primary/main storage 2.6 Secondary/backing storage 2.7 Number systems	1	3
	3 – 4	3. Basic Computer Hardware and Software Servicing with Troubleshooting 3.1 Application installation and configuration 3.2 Disassembly/assembly 3.3 Basic computer troubleshooting	2	6
	5 – 6	4. Software and Productivity Tools 4.1 Mail Client Software (MS Outlook, or equivalent) 4.2 Word processor (MS Word, or equivalent)	2	6
	7 – 8	4.3 Types of data 4.4 Spreadsheet application (MS Excel, or equivalent)	2	6
	9 – 10	4.5 Presentation program (MS PowerPoint, or equivalent)	2	6

Term	Week	Topic	Time Allotment (in hours)	
			Theoretical	Demonstration/ Practical Work
	11 – 12	5. Data Communication and Computer Networks 5.1 Types of computer networks based on geographical span 5.2 Computer network devices – network linking devices and communication media 5.3 Types of network topologies 5.4 Communication technologies 5.5 Protocol and OSI model 5.6 Shipboard computer network and internet access 5.7 Network standardisation process and security 5.8 Setting-up small scale wired local area network 5.9 Basic network troubleshooting	2	6
	13 – 14	6. Cyber Security 6.1 Cyber security threats and vulnerabilities 6.2 Stages of cyber attacks 6.3 Cyber security protection and response to cyber security incidents 6.4 Cyber laws and regulations 6.5 Cyber security risk management approach	2	6
	15 – 17	7. Fourth Industrial Revolution Technologies 7.1 Big Data 7.2 IoT 7.3 Blockchain 7.4 Artificial Intelligence 7.5 3D Printing 7.6 Augmented and Virtual Reality 7.7 Digitalisation and Autonomous Ships	3	9

Sub-total (Contact Hours)	17	51
Total Contact Hours	68	
Examination and Assessment		

Note:

1. *The MHEIs are to develop their respective weekly class schedule according to their resources ensuring that the minimum time allocation for the contact hours is met.*
2. *The MHEIs shall determine the time allotment for the conduct of summative assessments.*

Part C: Course Syllabus

COs	Topics Learning Outcomes	References/ Bibliographies	Teaching Aids
CO1	<p>1. Introduction to Computer Systems <i>Main components of computer system – Hardware and software</i></p> <p>1.1. Describe the computer system in relation to its main components</p> <p><i>Types of computers</i></p> <p>1.2. Describe the different types of computers and their use</p> <p><i>CPU and GPU</i></p> <p>1.3. Compare central processing unit and graphics processing unit with regards to their advantages, disadvantages, uses and functions</p> <p><i>Operating and application systems</i></p> <p>1.4. Compare operating and application systems with regards to their processes and functions</p>	R5, R6, R7, B1, B2	A1, A2, A3, A4
CO1	<p>2. Computer Hardware and Storage Devices <i>Input devices, Output devices and Input/output devices issues</i></p> <p>2.1. Identify the different input and output devices, their functions and purposes</p> <p>2.2. Trouble shoot common input/output devices issues: port connection issues; driver related issues</p> <p><i>Cache memory, Primary/main storage and Secondary/backing storage</i></p> <p>2.3. Compare and contrast main memory and backing storage with regards to their usage, benefits and performance</p> <p>2.4. Perform system maintenance for computer data storage</p> <p>2.5. Implement effective computer files and folder management</p> <p><i>Number systems</i></p> <p>2.6. Explain the importance and relevance of number systems in computer systems</p> <p>2.7. Convert between decimal, binary, octal and hexadecimal number systems</p>	R5, R6, R7, B1, B2	A1, A2, A3, A4
CO1	<p>3. Basic Computer Hardware and Software Servicing with Troubleshooting <i>Application installation and configuration</i></p> <p>3.1. Install and configure applications by different methods including using data storage devise (e.g., CD-ROM, DVD-ROM, Flash Drive), internet, app store (e.g., Microsoft Store, Mac App Store) and web based apps</p>	R6, R7, B1, B2	A1, A2, A3, A4



COs	Topics Learning Outcomes	References/ Bibliographies	Teaching Aids
	Disassembly/assembly and Basic computer troubleshooting 3.2. Perform basic disassembly/assembly and troubleshooting of a computer		
CO1	<p>4. Software and Productivity Tools</p> <p>Mail Client Software (MS Outlook, or equivalent) 4.1. Create and send a message in a mail client software utilising its different functions and tools including: account information and address book; email signature; sending and receiving emails; delivery and read receipts; and calendar, reminders and tasks</p> <p>Word processor (MS Word, or equivalent) 4.2. Create a word file utilising the different functions and tools of the word processor including: files names and types; page lay-out; formatting and styles; headers and footers; tables and graphics; references; and spelling and grammar checker 4.3. Use Mail Merge function to send personalised emails to multiple recipients</p> <p>Types of data 4.4. Compare and contrast databases and spreadsheets in terms of their use 4.5. Describe the different data types and formats used in a database and its components and functions 4.6. Create a database table with organised data</p> <p>Spreadsheet application (MS Excel, or equivalent) 4.7. Create a spreadsheet utilising the different functions and tools of the spreadsheet application including: files names and types; page lay-out; formatting and styles; formulas; charts; and data</p> <p>Presentation program (MS PowerPoint, or equivalent) 4.8. Create a slide show utilising the different functions and tools of the presentation program including: files names and types; formatting and styles; texts, graphics, animations and transitions; and design layout and templates</p>	B1, W1, W2, W3, W4, W5, W6, W7	A1, A2, A3, A4
CO2 CO3	<p>5. Data Communication and Computer Networks</p> <p>Types of computer networks based on geographical span 5.1. Compare and contrast different computer networks with regards to their characteristics and purpose including: PAN; LAN; WLAN; WAN; Internet; and Intranet</p> <p>Computer network devices – network linking devices and communication media 5.2. Identify the common computer network devices and their functions</p> <p>Types of network topologies, Communication technologies and Protocol and OSI model</p>	R4, R5, R6, R7, B1, B2, P2	A1, A2, A3, A4

COs	Topics Learning Outcomes	References/ Bibliographies	Teaching Aids
	<p>5.3. Describe the different network protocols and topologies with regards to their use, advantages and disadvantages</p> <p>5.4. Describe the transfer of data such as text, images and videos over a network using different communication technologies</p> <p>Shipboard computer network and internet access</p> <p>5.5. Describe the set-up of a shipboard computer network involving access to the internet</p> <p>Network standardisation process and security, Setting-up small scale wired local area network and Basic network troubleshooting</p> <p>5.6. Set-up a small-scale wired local area network with a common shared folder</p>		
CO4	<p>6. Cyber Security</p> <p>Cyber security threats and vulnerabilities</p> <p>6.1. Describe the different cyber security threats to on-board operation and vulnerabilities with regards to the motivation and objectives and the mode of attacks</p> <p>Stages of cyber attacks</p> <p>6.2. Describe the stages of a cyber-attack in terms of their effect to the ICT infrastructure and detectability</p> <p>6.3. Cite examples of cyber-attacks to computer and computer networks and its effect to on-board operation</p> <p>Cyber security protection and response to cyber security incidents</p> <p>6.4. Explain methods and procedures in protecting computers and computer networks from cyber attacks</p> <p>6.5. Apply methods and procedures in protecting computers and computer networks from cyber attacks</p> <p>Cyber laws and regulations</p> <p>6.6. Outline the international and national laws and regulations for cybercrime protection</p> <p>6.7. Cite examples of application on international and national laws and regulations for cybercrime protection</p> <p>Cyber security risk management approach</p> <p>6.8. Describe the cyber security risk management approach in maritime</p> <p>6.9. Interpret a cyber-security risk management plan for shipboard and shore application given a scenario</p>	R1, R2, R3, R5, R6, R7, R8, B1, B2, P2	A1, A2, A3, A4
CO5	<p>7. Fourth Industrial Revolution Technologies</p> <p>7.1. Explain the relevance and application of information and communication technologies to maritime and shipping</p> <p>7.2. Explain the socio-economic impacts of information and communication technologies to shipboard operation</p>	B1, B2, P1, P2, P3, P4	A1, A2, A3, A4

Note: The MHEIs are to develop Part D: Detailed Teaching Syllabus and Instructional Materials (IMs), and Part E: Course Assessment and Assessment Tools (ATs) which satisfactorily meets with the requirements of the course as prescribed in the course outcomes and learning outcomes.