Maritime & Coastguard Agency

Consultation Report: Cadet Training & Modernisation Programme Syllabus Review – Third Group of Consultation Templates

June 2023

Contents

Foreword

The Maritime and Coastguard Agency (MCA), an executive Agency of the Department for Transport (DfT), carried out a public consultation on behalf of the Cadet Training and Modernisation (CT&M) Programme from 20th February to the 20th March 2023 regarding the Cadet Training Syllabus Review. The consultation was published on 20th February 2023 and notification of the consultation was sent to all participants of the CT&M Programme for wider dissemination through the maritime industry. This was also promoted on social media platforms and maritime news outlets.

The proposed amendments to the Cadet training syllabus were published in multiple formats and feedback on these amendments was gathered through surveys hosted on Smart Survey.

1 Key Findings

1.1 Introduction

1.1.1 Through the process of the consultation, it has been found that the majority of survey respondents agreed with the changes suggested by CT&M Sub-Group 1.2.

1.2 Consultation

1.2.1 The third consultation was carried out between 20th February and 20th March 2023 and can be found at: www.gov.uk

1.2.2 A total of 45 responses were received across the eight templates. With all respondents answering every question posed on their survey. A summary of consultee responses and the action taken by CT&M Sub-Group 1.2 as a result can be found in **Annex A**. A more detailed summary can be found in the accompanying 'Detail of feedback received' section of the consultation page. The answers given have been fully and carefully considered.

1.2.3 This consultation has been completed in order to ensure best practice has been followed and provide the opportunity for feedback from the entire maritime industry. There was no legal requirement to undertake this consultation.

Consultation Outcome

2 Summary of responses

2.1 Introduction

2.1.1 A total of 39 outcomes over eight templates were posed in the second consultation.

2.1.2 These outcomes, together with the consultees comments and the Cadet Training & Modernisation Sub-Group 1.2's response, are shown in detail in the accompanying 'Detail of feedback received' section of the consultation page. However, the main points are summarised below at Annex A.

2.1.3 Finalised versions of each module can also be found in the 'Detail of outcome' section of the consultation page.

3 Our response

3.1 What happens next?

3.1.1 The MCA will make the appropriate amendments to the syllabus templates. These will then be used to create academic modules that will form the new Cadet training syllabus with a view to complete this process by the end of 2023.

3.1.2 Once these academic modules have been created, it will take approximately 12 to 18 months to implement the new syllabus.

3.1.3 Cadet Assessment and the Training Record Book will also be amended to reflect these changes.

ANNEX A

SUMMARY OF THE CONSULTATION OUTCOMES, CONSULTEE FEEDBACK AND SUB-GROUP 1.2 RESPONSES TO THE FEEDBACK

Each module had its own survey which included the recommendations of Sub-Group 1.2:

ETO - DC and AC Principles			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Solve problems involving basic electrical concepts and theorems	**Keep**	**100%**	**None**
1.1 Electrostatic and magnetic fields	Modernise	100%	None
1.2 Electrical quantities (charge, current, emf, voltage, resistance, inductance and capacitance)	Keep	100%	None
1.3 Waveforms	Keep	100%	None
1.4 Ohm's Law (applied to dc circuits only)	Keep	100%	None
1.5 Kirchhoff's Law (applied to dc circuits only)	Keep	100%	None
1.6 Circuit reduction techniques (as applied to combinations of series and parallel resistors only)	Keep	100%	None
1.7 Circuit reduction techniques (as applied to combinations of series and parallel capacitors only)	Keep	100%	None
1.8 Voltage and current division	Keep	100%	None
1.9 Energy and power (in dc circuits only)	Keep	100%	None
1.10 Network theorems (Superposition, Thevenin's,	Add	N/A	Add this outcome.

Norton's, Maximum Power Transfer)			Suggestion from industry consultation to provide a sound understanding of network theorems.
Outcome 2: Solve single-phase ac circuit problems using complex notation	**Keep**	**100%**	**None**
2.1 Circuit responses to the sudden application or removal of a dc voltage to an R – L series circuit	Keep	100%	None
2.2 Calculation of impedance, current and voltages in a R - L - C series circuit using complex notation	Keep	100%	None
2.3 Phasor (Argand) diagram representation of current and voltage quantities associated with an R - L - C series circuit	Keep	100%	None
2.4 Calculation of apparent, active and reactive powers and power factor associated with an R - L - C series circuit	Keep	100%	None
2.5 Determination of total circuit impedance and supply current in a series-parallel circuit using complex notation and circuit reduction techniques	Keep	100%	None
2.6 Calculation of branch currents in a parallel circuit using current division	Keep	100%	None
2.7 Calculation of apparent, active and reactive powers and power factor associated with a series parallel circuit	Keep	100%	None
Outcome 3: Demonstrate Knowledge of electromagnetic field concepts and circuits	**Add**	**N/A**	**Add this outcome.** **Suggestion from industry consultation to provide a sound understanding of**

			electrical machines and magnetic curves
3.1 Magnetic quantities (MMF, Flux and Reluctance)	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
3.2 Simple magnetic circuit calculations	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
3.3 Composite magnetic circuits	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
3.4 Induced emf and current	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
3.5 Leakage fluxes	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves

3.6 Magnetic losses	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
3.7 Pulsating and rotating MMFs	Add	N/A	Add this outcome. Suggestion from industry consultation to provide a sound understanding of electrical machines and magnetic curves
Outcome 4: Solve problems involving resonating passive circuits	**Add**	**N/A**	**Add this outcome.** **Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.**
4.1 Resonant frequency and dynamic impedance in an Resistor (R)- Inductor (L) – Capacitor (C) series circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.
4.2 Q-Factor and bandwidth in an R-L-C series circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.

4.3 Impedance/ frequency graphs and current/ frequency graphs associated with an R-L-C series circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.
4.4 Resonant frequency and dynamic impedance in an R-L in parallel with C circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.
4.5 Q-Factor and dynamic impedance in an R-L in parallel with C circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.
4.6 Impedance/ frequency graphs and current/ frequency graphs associated with an R-L in parallel with C circuit	Add	N/A	Add this outcome. Suggestion from industry consultation that resonating circuits are needed for applications such as radio transmission, signal processing and communication.
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**

Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

ETO - Transformers			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Explain the construction characteristics of transformers	**Keep**	**100%**	**None**
1.1Transformer core type construction	Keep	50%	None
1.2 B/H curves	Keep	100%	None
1.3 Eddy current losses within the core	Keep	100%	None
1.4 Applied voltage and induced voltage	Keep	100%	None
1.5 Production of harmonics	Keep	100%	None
1.6 Instrument Transformers	Add	N/A	Add this outcome. Suggestion from industry consultation that ETOs need the knowledge of the principles of working with Instrument transformers such as CT & PT.
Outcome 2: Analyse the operation of single-phase transformers on load	**Keep**	**100%**	**None**
2.1 Full transformer equivalent circuit and simplified equivalent circuit	Keep	100%	None
2.2 Calculation of equivalent resistance and reactance	Keep	100%	None
2.3 Open and short circuit tests	Keep	100%	None
2.4 Calculation of the transformer efficiency for full load, half load and different power factors	Keep	100%	None
2.5 Voltage regulation	Modernise	100%	None
2.6 Parallel operation of single-phase transformers	Modernise	100%	None

Outcome 3: Analyse the operation of three phase transformers	**Keep**	**100%**	**None**
3.1 Transformer winding connections, vector diagrams, vector symbols and phase displacements	Keep	100%	None
3.2 Conditions for parallel operation of three phase transformers	Keep	100%	None
3.3 Tap changing	Modernise	100%	None
3.4 Transformer cooling classifications	Keep	100%	None
Outcome 4: Explain transformer protection	**Keep**	**100%**	None
4.1 Effects of short circuit faults	Keep	100%	None
4.2 Gas-Oil actuated (Buchholz) relay	Keep	100%	None
4.3 circuit breakers	Keep	100%	None
4.4 Surge protection	Keep	100%	None
4.5 Means of transformer protection against overcurrent and earth fault, including the use of different types of relays	Add	N/A	Add this outcome. ETOs need to know the different protection systems on transformers.
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**

Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

Deck - Emergency Response and Communication			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Explain how to respond to distress signals in a maritime situation.	**Keep**	**100%**	**“Talks from industry representatives with experience of emergency response situations” have been suggested as a teaching method.**

1.1 Distress, urgency, and safety signals A. Annex IV International Regulations for Preventing Collisions at Sea. SOLAS, B. IAMSAR Manual. Annual Summary Admiralty Notice to Mariners-Notice No.4 C. Ships in distress, Statutory Distress Signals, EPIRBs and SARTs D. Radio watch for and reception of distress signals E. Sunken submarine F. Aircraft casualties at sea G. RT Distress procedure H. Instructions to lookouts	Keep	100%	None

1.2 How to communicate with the distressed craft in accordance with International Regulations and procedures. A. Action on receiving a distress signal B. Recording the distress message C. IAMSAR manual: communications	Modernise	95%	None
1.3 How to obtain information on the position and nature of the distress A. Components of the distress message B. Identification, position, nature, and kind of assistance required C. Other information D. Technique of homing on radio signals	Keep	95%	We will provide clarity on the technique of homing on radio signals, this applies for shore-based search and rescue facilities, and the use of SARTs.
1.4 The further action required to comply with contingency planning and master's instructions A. IAMSAR manual: Action by assisting ships B. Immediate action C. Proceeding to the area of distress — On board preparation D. Aircraft casualties at sea E. Follow a contingency plan	Keep	100%	None

1.5 Planning and preparation for a search A. Categories of distress incidents: Coastal and ocean B. Abbreviations, terms and definitions C. Communications: internal and external D. Co-ordination of search and rescue operations E. Designation of SMC and OSC and their responsibilities F. Responsibility of other craft in the co-ordinated search G. Search patterns taking into account drift, leeway, visibility and type of assistance available H. Drift patterns of disabled vessels with relation to wind and currents I. Rendezvous J. Establish a datum point before commencing search pattern K. Contingency planning and training	Modernise	95%	None
1.6 How to conduct a search A. Proceeding to the area of distress B. On board preparation C. Action by assisting ships D. Approaching the scene, radar search E. Arrival on scene, implement search plan F. Assistance by SAR aircraft G. Homing on radio signals H. Aircraft casualties	Modernise	95%	None

1.7 How to conduct a rescue: A. When survivors in the water/boats/rafts B. From ditched aircraft C. Fire D. Heavy weather E. Evacuation by helicopter	Modernise	100%	None
1.8 How to terminate SAR operations A. Care of and questioning of survivors B. Decision to terminate, factors to consider C. Reports to authorities	Keep	95%	None
1.9 The general arrangements for search and rescue: A. The global maritime distress and safety system B. In addition to ships, the assistance which may be given by authorities around the coast of the United Kingdom C. Ships' position and reporting systems	Keep	100%	None
1.10 The obligations and responsibilities for assistance at sea and the action to be taken to render assistance A. IAMSAR Manual — Annual Summary of Admiralty Notices to Mariners -Notice 4 B. Consultation with other stations answering the distress C. Legal obligations D. Exemptions from answering a distress E. Logbook entries	Modernise	95%	None
Outcome 2: Describe IMO approved communication	**Keep**	**100%**	**None**

procedures used to avoid misinterpretation at sea.			
2.1 IMO standard marine communication phrases	Keep	100%	None
2.2 International code of signals	Keep	100%	None
2.3 Radio distress communication procedures	Keep	100%	None
Outcome 3: Transmit and receive information by visual means, as directed by the International Code of Signals	**Keep**	**89%**	**Further guidance will be provided in the academic guidance document to bring in line with the baseline requirements of STCW: "Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals"**
3.1 Send and receive signals using Morse code by means of flashing light	Modernise	79%	None
3.2 Send and transmit signals using the International Code of Signals	Keep	89%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**

Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	84%
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

Marine Engineering - Process Control			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Read a pipe and instrument diagram	**Keep**	**100%**	**None**
1.1 Identify and explain symbols to BS1553, BS1646 and ISO 14726.	Modernise	67%	Added ISO 14726.
Outcome 2: Select a control valve and be able to size the valve to a particular operation.	**Keep**	**100%**	**None**
2.1Select the appropriate trim for a given application	Keep	100%	None
2.2 Select the appropriate size of valve for a given application	Keep	100%	None
2.3 Select the appropriate valve body material for a given application	Keep	100%	None
2.4 Select the appropriate fail-safe condition for the valve	Keep	100%	None
Outcome 3: Explain and classify controllers	**Keep**	**100%**	**None**
3.1 Gain/Proportional band, integral action time, derivative action time	Keep	100%	None
3.2 Analogue controllers, time constant, generation of control modes/actions	Keep	100%	None
Outcome 4: Set-up or stimulate a process control system and tune the system for optimum safe operation	**Keep**	**100%**	**None**

4.1 Feedback control systems, response to set point/load changes, offset/steady state a paper composed of an appropriate balance of short answer, restricted response and structured questions, errors, overshoot, initial rate of change, setting time	Modernise	100%	None
4.2 Effects of P, I and D variables and their constants on system response	Keep	100%	None
4.3 Tuning of closed loop systems using open/closed loop methods	Keep	100%	None
4.4 Use of process analysers for tuning	Keep	100%	None
4.5 Process Characteristics: distance velocity lags, transfer lags, time constant, process interactions	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%

Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

Marine Engineering - Fundamentals of Control Systems and Transducers			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Explain control system elements and signals	**Keep**	**100%**	**None**
1.1 Functions of control system elements and signals	Modernise	100%	None
1.2 Characteristics of analogue and digital signals	Keep	100%	None
1.3 Transmission of analogue signals	Keep	100%	None
1.4 Transmission of digital signals	Keep	100%	None
1.5 Functions of signal conditioning devices	Keep	100%	None
Outcome 2: Explain the operation and application of a range of transducers used in control systems	**Keep**	**100%**	**None**
2.1 Operation and application of a range of transducers suitable for measuring the following variables: temperature, flow, displacement, velocity, pressure, strain, position, level and light	Keep	100%	None
2.2 Properties of transducers	Keep	100%	None
2.3 Identification of suitable transducers for various control systems	Keep	100%	None
Outcome 3: Describe the structure and behaviour of control systems	**Keep**	**100%**	**None**
3.1 Sequence control systems	Keep	100%	None
3.2 On-off control systems	Keep	100%	None
3.3 Block diagram representation of open and closed loop systems	Keep	100%	None

3.4 Transient and steady state behaviour of open loop systems in response to the application of a Unit step input	Keep	100%	None
3.5 Transient and steady state behaviour of closed loop systems in response to the application of a Unit step input	Keep	100%	None
3.6 The use of controllers to modify open loop system responses	Keep	100%	None
3.7 The use of controllers to modify closed loop system responses	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template	100%

		has Human Element Factor recommendations but please do add any you feel may have been missed.	
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

Deck - Celestial Navigation			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Demonstrate the use and maintenance of relevant precision instruments.	**Keep**	**93%**	**None**
1.1 Using the sextant	Keep	93%	None
1.2 Possible errors of a sextant and methods of correction	Modernise	93%	None
1.3 Sextant observations	Keep	93%	None
1.4 Use the chronometer	Modernise	93%	None
1.5 Coordinated Universal Time (UTC), Greenwich Mean Time (GMT) and Chronometer Time	Remove	100%	None
1.6 Local Mean Time (LMT), Zone Time (ZT) and Standard Time (ST)	Remove	100%	None
Outcome 2: Apply the principles and concepts of the celestial sphere to navigation techniques	**Modernise**	**93%**	**None**
2.1 Key components of the celestial sphere	Modernise	93%	None
2.2 Use of the nautical almanac to find the Greenwich Hour Angle (GHA), Local Hour Angle (LHA) and declination of sun stars and planets	Modernise	93%	None
2.3 Use of nautical almanac altitude correction tables	Modernise	93%	None
2.4 Predicting the time of twilight, meridian passage, sunrise and sunset	Modernise	93%	None
2.5 Using UTC, GMT, LMT, ST and ZT and Chronometer Time	Modernise	93%	None
2.6 Factors influencing the suitability of celestial bodies for sights	Modernise	93%	None

2.7 Use of planet and star diagrams in the nautical almanac	Modernise	93%	None
2.8 Star charts or short method tables to pre-compute altitudes and azimuths of stars to determine availability for position fixing	Modernise	93%	None
2.9 NP323 star finder and identifier	Modernise	93%	None
2.10 Star constellations	Modernise	93%	None
2.11 Random and systematic errors	Modernise	93%	None
2.12 Resolution of the cocked hat	Modernise	93%	None
Outcome 3: Evaluate the accuracy of gyro and magnetic compasses using celestial objects.	**Keep**	**100%**	**None**
3.1 Calculation of compass error and deviation by means of azimuths of celestial bodies and amplitude of the sun	Modernise	86%	None
3.2 Calculation of compass error using polaris	Modernise	93%	None
3.3 The reliability of compass errors obtained from celestial objects in relation to random and systematic errors	Modernise	93%	None
Outcome 4: Determine the position of a ship using a range of celestial navigation techniques.	**Modernise**	**100%**	**None**
4.1 Use of nautical almanac to find the time of meridian passage for the sun	Modernise	93%	None
4.2 Application of TZD to declination to obtain latitude	Modernise	93%	None

4.3 Correction of true altitude of polaris to obtain position line and latitude	Modernise	93%	None
4.4 Marc St. Hilaire method (by calculation or short method tables) to obtain a position line and a point through which it passes	Modernise	93%	None
4.5 Plotting position lines	Modernise	93%	None
4.6 Fix the vessel's position by means of celestial observations	Modernise	93%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please	100%

		do add any you feel may have been missed.	
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	86%

ETO - Electrical Systems in Potentially Explosive and Gas Hazardous Environments			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome 1: Describe the properties of flammable materials and the hazards associated with electrical equipment for use in potentially explosive and corrosive areas	**Modernise**	**100%**	**None**
1.1Properties and characteristics of vapours and gasses likely to cause explosion.	Modernise	100%	None
1.2 Gas and equipment groupings	Modernise	100%	None
1.3 Identify hazards likely to cause ignition from electrical and other sources	Modernise	100%	None
1.4 Definition of hazardous areas	Modernise	100%	None
1.5 Zone and temperature classification	Modernise	100%	None
1.6 Selection of apparatus in relation to zone, temperature class and gas group BS EN 60079-14	Modernise	100%	None
1.7 Standard methods of explosion protection	Modernise	100%	None
1.8 Ingress protection index in relation to codes IEC 529 and EN 60529	Modernise	100%	None
1.9 Ingress protection requirements of apparatus	Modernise	100%	None
Outcome 2: Outline the structure of Standards and Codes of Practice, and explain the certification process and design testing for electrical equipment	**Modernise**	**100%**	**None**

2.2 Test houses and notified bodies	Keep	100%	None
2.3 The certification process for Ex equipment	Keep	100%	None
2.4 Confirmation of equipment design to meet the requirements of and compliance with current standards	Keep	100%	None
2.5 CE marking certification and labelling of equipment	Keep	100%	None
Outcome 3: Describe the constructional features and installation practices for power electrical equipment designed to provide explosion protection	**Modernise**	**100%**	**None**
3.1 Description of EEx ‘d’ (Flameproof) protection method including types of flame path and the methods of containment and suppression of and internal explosion	Keep	100%	None
3.2 Description of EEx ‘e’ (Increased Safety) protection method including the design features and methods to control temperature and eliminate arcing and sparking	Keep	100%	None
3.3 Description of EEx ‘n’ (non-incentive) protection method including constructional features to control heat, arcing and sparking	Keep	100%	None
3.4 Description of EEx ‘p’ (Pressurised) method of protection including specialist applications for purging and pressurisation	Keep	100%	None

3.5 Description of installation techniques including the selection of cable glands and earthing and bonding	Keep	100%	None
Outcome 4: Explain the operation of intrinsically safe electrical apparatus and associated components designed to provide explosion protection	**Keep**	**100%**	**None**
4.1 Description of operation and use of Zener barrier and Galvanic interface devices including the principle of controlling fault energy levels	Keep	100%	None
4.2 Explanation of EEx 'i'a and EEx 'i'b (intrinsically safe) protection including the identification of zones of use, advantages and applications	Keep	100%	None
4.3 Description of the installation of Zener barrier and Galvanic isolators including the practices for terminating conductors, maintaining earth integrity and the security of system operation	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	**How would you assess this outcome/ objective?**	**Action required**	**Consultation Support %**
Include impact of modern fuels and dangerous cargoes on electrical systems in potentially explosive environments.	As fuel types are changing and low flashpoint fuels are introduced to reduce vessel's carbon footprint, dangerous cargo and modern fuel elements should be compulsory for all officers.	Embed elements relevant to electrical systems in potentially explosive environments from dangerous cargo, oil, gas, chemical and low flashpoint fuel endorsements.	100%

Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
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ETO - Electrical Safety			
Outcome	**Sub-Group 1.2 Recommended Action**	**Consultation Support %**	**Changes made as a result of industry feedback**
Outcome1: Explain the features of an operational plan for safe working on electrical systems	**Keep**	**100%**	**None**
1.1 Dangers of electricity Concepts of Hazard and Risk	Keep	100%	None
1.2 Concepts of Hazard and Risk	Keep	100%	None
1.3 Features of a Risk Assessment	Keep	100%	None
1.4 Awareness of the Responsibilities of personnel under the provision of the Health and Safety at Work etc. Act 1974 and the Electricity at Work Regulations	Modernise	100%	None
1.5 Awareness of the need for safe isolation procedures	Keep	100%	None
1.6 Appreciation of the need for safe working practices	Keep	100%	None
1.7 Features of a typical Operational Plan for safe working on an electrical system	Keep	100%	None
Outcome 2: Explain the features of electrical distribution and the need for protection and isolation for safe working on 'dead' systems	**Keep**	**100%**	**None**
2.1 Distribution system including control equipment, overcurrent protection devices, isolation and switching equipment	Keep	100%	None
2.2 Earthing and the earth fault loop path	Keep	100%	None

2.3 The use of residual current devices for protection and isolation of the system	Keep	100%	None
2.4 Documentation and plans of relevant distribution network	Keep	100%	None
2.5 Features of safe isolation and 'Locking Off' procedures	Keep	100%	None
2.6 The use of warning notices for 'isolated' and 'non-isolated' sections of the system	Keep	100%	None
2.7 The use of test and proving instruments	Keep	100%	None
Outcome 3: Demonstrate the features of a permit-to-work system	**Keep**	**100%**	**None**
3.1 Purpose of a permit-work system Activities requiring permit-to-work systems of work	Keep	100%	None
3.2 Identification of dangers associated with working on high voltage systems. Identification of isolation and earthing points	Keep	100%	None
3.3 Safe isolation, proving dead, and earthing procedures	Keep	100%	None
3.4 Identification of precautions to minimise risk due to specific work activities	Keep	100%	None
3.5 Permit-to-work documentation	Keep	100%	None
3.6 Permit-to-work issuing and cancelling procedures	Keep	100%	None
Outcome 4: Explain high voltage at operational level in marine electrical practice	**Add**	**100%**	**None**
4.1 High voltage marine generators and systems	Add	100%	None

4.2 High voltage protection devices and circuit protection	Add	100%	None
4.3 Insulated and earthed neutral distribution systems and earthing requirements	Add	100%	None
4.4 Safety requirements necessary for HV installations	Add	100%	None
4.5 Safe working practice and permit to work	Add	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
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