

Proposal to modernise the Methodology of Teaching, Assessment/ Examination

Engineering STCW III/1 COC			
Competency/ Module: Engineering technical officer			
Knowledge, understanding and proficiency	Recommendation of working group regarding the outcome and objective.	Rationale	Action required
Outcome 1: Procedures	Include Human Element Factors	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.	Consider overarching Human Element Factors in all HSE aspects for these workshop skills, including Human Machine Interface.
1.1 Code of safe working practices	Keep	Relevant	None
1.2 Hazards	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 2: Risk Assessment.	Re-arrange this to outcome 2 and bring outcomes 3.2, 3.3, 3.4, 3.7, 3.8 to here
1.2 Provision use of equipment	Add & modernise	This sub-outcome is more appropriate in this outcome than outcome 3. Multi-meters are commonly used in onboard practice and should be included in this sub- outcome.	Move this sub-outcome from outcome 3 to outcome 1. Include the use of multi-meters, with reference to electrical drawings.
1.3 Use of tools and equipment	Add	This sub-outcome is more appropriate in this outcome than outcome 3.	Move this sub-outcome from outcome 3 to outcome 1.

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1.4 Portable power operated tools and equipment	Add	This sub-outcome is more appropriate in this outcome than outcome 3.	Move this sub-outcome from outcome 3 to outcome 1.
1.5 Workshop and bench machines (fixed installations)	Add	This sub-outcome is more appropriate in this outcome than outcome 3.	Move this sub-outcome from outcome 3 to outcome 1.
1.6 Manual handling	Add	This sub-outcome is more appropriate in this outcome than outcome 3.	Move this sub-outcome from outcome 3 to outcome 1.
Outcome 2: Risk Assessment (RA)	Keep	Relevant	None
2.1 Assessment	Keep	Relevant	None
2.2 Principles	Include Human Element Factors	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.	Consider human factors in risk assessment, including the following resources: https://www.hse.gov.uk/humanfactors/resources/risk-assessment.htm
2.3 Hazard identification	Contextualise	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.	Include commonly found hazards on a ship, making use of hazard identification tools.
2.4 Risk control measures	Contextualise	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.	Include reference to the practical steps we can take onboard a vessel to control risk. Use case studies and make reference to how these steps can be highlighted in RAs.

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2.5 Hazards	Add	<p>This sub-outcome is more appropriate in this outcome than outcome 1.</p> <p>This outcome should highlight regularly experienced, ship specific hazards such as weather.</p>	<p>Move this sub-outcome from outcome 1 to outcome 2.</p> <p>Include hazards regularly seen on-board modern-day vessels as examples.</p>
Outcome 3: Permit to work systems	Keep	Relevant	None
3.1 Permit to work checklist	Keep	Relevant	None
3.2 Provision use of equipment	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 1: Procedures	Re-arrange this to outcome 1
3.2 Definition and purpose of a Permit to Work	Add this sub-outcome	This would enhance the candidate's understanding of Permit to Work Systems	Add this sub-outcome.
3.3 Use of tools and equipment	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 1: Procedures	Re-arrange this to outcome 1
3.3 Information included on a Permit to Work	Add this sub-outcome	This would enhance the candidate's understanding of Permit to Work Systems	Add this sub-outcome.
3.4 Portable power operated tools and equipment	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 1: Procedures	Re-arrange this to outcome 1
3.4 Types of Permit to Work	Add this sub-outcome	This would enhance the candidate's understanding of Permit to Work Systems	<p>Add this sub-outcome.</p> <p>Include industry specific Permits to Work</p>
3.5 Electrical shock	Keep	Relevant	None
3.6 Electrical wiring	Keep	Emphasis on how to read ship specific drawings.	Wiring diagrams from the ships

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3.7 Workshop and bench machines (fixed installations)	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 1: Procedures	Re-arrange this to outcome 1
3.8 Manual handling	Amend - move to a different outcome	This sub-outcome is more relevant to Outcome 1: Procedures	Re-arrange this to outcome 1
Outcome 4: Lock out procedures	Contextualise	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.	<p>Link this outcome to outcome 3 to provide an overview of the whole process.</p> <p>Include:</p> <ul style="list-style-type: none"> - Practical use of different lock out/ tag out on systems - Purpose of permit to work, warning notices Sanction test
Outcome 5: Electricity at work regulations (1989)	Contextualise	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	<p>Include examples from a maritime working environment, such as:</p> <ul style="list-style-type: none"> - Earthing - Isolated Systems - Isolation of a Electrical/mechanical systems typically found onboard a vessel (Show cadets different types of locking devise. E.g. Hasp, MCB lockout, clamp etc.)
5.1 Safe isolation procedures	As per outcome 5	As per outcome 5	As per outcome 5
5.2 Safe isolation practice	As per outcome 5	As per outcome 5	As per outcome 5
5.3 Isolation of individual circuits	As per outcome 5	As per outcome 5	As per outcome 5

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5.4 Isolation of individual circuits protected by circuit breakers	As per outcome 5	As per outcome 5	As per outcome 5
5.5 Isolation of individual circuits protected by fuses	As per outcome 5	As per outcome 5	As per outcome 5
5.6 Neutral conductor	As per outcome 5	As per outcome 5	As per outcome 5
5.7 Proving dead	As per outcome 5	As per outcome 5	As per outcome 5 In addition, this should be linked to outcome 4 to show in the context of lock out procedures.
5.8 Unused or unidentified cables	As per outcome 5	As per outcome 5	As per outcome 5
5.9 New installations	As per outcome 5	As per outcome 5	As per outcome 5 In addition, the regulations should be covered, showing candidates where to find this information.
Outcome 6: Use of a residual current device (RCD)	Keep	Relevant - mainly for cruise vessels	None
Outcome 7: Portable appliance test (PAT)	Keep	Relevant	None
7.1 Examples of PAT class 1 and class 2 appliances and power cords	Keep	Relevant	None
Outcome 8: Electronics	Keep	Relevant	None
8.1 Resistor colour code	Contextualise	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	Include a basic overview including where to find data sheets. Include multi-meter use and precautions to account for

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		current and future seagoing technologies and practices.	
8.2 Electron components; identification, testing and preparation for soldering	Keep	Relevant	None
8.3 Diodes and testing of various diodes	Keep	Relevant	None
8.4 Transistors and testing	Keep	Relevant	None
8.5 Capacitors and testing	Keep	Relevant	None
8.6 Design and build electronic circuits using discrete components on circuit board	Add	This outcome is relevant on-board modern vessels.	Add this outcome
8.7 Take measurements on electronic circuits using a range of instruments	Add	This outcome is relevant on-board modern vessels.	Add this outcome
Outcome 9: Motors-3 Phase inc construction	Keep	Relevant	None
9.1 Testing a motor, motor-starter control equipment - Build, test, and commission	Contextualise	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.	Include electrical drawings. Incorporate with the Starter circuits.

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9.2 Polarisation index, an alternative way to IR test	Contextualise with High Voltage (HV) systems	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.	Include the relevance in a HV system. Show practical side of the HV theory module and HV safe practices.
9.3 PI - Best practice and IEEE Regs	Keep	Relevant	None
9.4 Relay circuits theory & practice using motor-starter control equipment	Keep	Relevant	None
Outcome 10: STAR (Y)/ DELTA (Δ) Theory / practise	Keep	Relevant	None
10.1 DOL Starters	Add	Currently the details of DOL Starters are taught but this is not clearly stated within the module, it should be.	Add this outcome
10.2 STAR (Y)/ DELTA (Δ)	Add	Currently the details of STAR (Y)/ DELTA (Δ) are taught but this is not clearly stated within the module, it should be.	Add this outcome
10.3 Soft Starter	Add	Currently the details of Soft Starters are taught but this is not clearly stated within the module, it should be.	Add this outcome
10.4 Variable frequency drive	Add	Currently the details of Variable frequency drives are taught but this is not clearly stated within the module, it should be.	Add this outcome

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Outcome 11: 3 Phase transformer connections and advantages	Keep	Relevant	None
Outcome 12: Batteries	Keep	Relevant	None
12.1 Valve regulated lead acid (VRLA) batteries	Modernise	Include modern battery technologies found onboard.	Include: <ul style="list-style-type: none"> - Sealed batteries. - Lithium ion - H2 Cells
12.2 Other types of VRLA batteries	Contextualise	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.	Include the response to emergencies involving different types of batteries.
12.3 Reasons why batteries fail	Keep	Relevant	None
12.4 Battery general care procedures	Keep	Relevant	None
12.5 Maintenance	Keep	Relevant	None
12.6 Determining when a battery is fully charged	Keep	Relevant	None
12.7 Testing the batteries	Keep	Relevant	None
12.8 Hydrometer use	Keep	Relevant	None
12.9 Load test battery - Motor starting	Keep	Relevant	None
12.10 Cold cranking amps	Keep	Relevant	None
12.11 Cranking amps	Keep	Relevant	None

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12.12 Reserve capacity	Keep	Relevant	None
12.13 Latest technological developments in battery	Include impact on propulsion systems	Seafarers should understand the impact of the technological developments of batteries on propulsion systems, such as ferries which use battery power.	Include impact on propulsion systems
Outcome 13: UPS - GMDSS - Navigation SIM room - Circuit diagram	Modernise	Include modern technologies found onboard.	Include rotary converters and clean power.
Outcome 14: Motor generator set v-belt replacement and tensioning	Contextualise	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.	Include maintenance of an alternator.
Outlook 15: Programmable logic controllers (PLC's)	Contextualise	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.	Include trouble shooting.
15.1 ladder logic	Keep	Relevant	None
15.2 Programming rules	Keep	Relevant	None
15.3 Addressing	Keep	Relevant	None
15.4 Safety	Keep	Relevant	None
15.5 Modification	Keep	Relevant	None

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15.6 Zero logic smart relay programming	Keep	Relevant	None
Outcome 16: Hazardous area electrical equipment report	Keep	Relevant	None
Outcome 17: Hazardous area electrical equipment - Cables and glands	Include an appreciation of the hazards caused by and safety measures required modern and future fuels.	Modern fuels can provide different hazards and require different safety measures for electrical equipment, this should be covered within this outcome.	Include an appreciation of the hazards caused by and safety measures required modern and future fuels (LNG, Dual Fuel, Methanol, Hydrogen, etc...). This should include the tanker safety elements
Outcome 18: Navigation lights system	Keep	Relevant	None
Outcome 19: Fire alarm system	Contextualise	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.	Include testing and fault finding.
Outcome 20: Generator switching simulator MODEQ-100	Contextualise	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.	Power management systems

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Outcome 21: Variable speed drive	Keep	Relevant	None
Outcome 22: Measuring physical quantities	Contextualise	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.	Include types of sensors and how they work.
Outcome 23: Instrumentation - Designing measurement circuits	Keep	Relevant	None
Outcome 24: The application of human factors principles to the design of devices and systems	Add this outcome	To provide seafarers with a contextualised understanding of the design devices that users accept willingly and operate safely in realistic conditions in the maritime industry, showing how theory can be put into practice at sea.	Add this outcome, including: <ul style="list-style-type: none"> - Ergonomic design of devices - Human Machine Interface
Proposal submitted by:	Any other outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:		
	Objective	Reason Why	Action required
Cadet Training and Modernisation Working Group	Consider crossover between workshop skills for Engineers and ETOs.	If there is crossover between the two workshop skills modules, they could be taught in conjunction to save time and resources for colleges, cadets and shipping companies alike.	When creating the finalised academic modules CT&M Sub-Group 1.2 will highlight any crossover between the two modules.

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Cadet Training & Modernisation Working Group	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.
Cadet Training & Modernisation Working Group	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.
Cadet Training & Modernisation Working Group	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.