Proposal to modernise the Methodology of Teaching, Assessment/ Examination

Marine Engineering - STCW III/1 CoC			
Competency/ Module: Marine Engineering: Heat Engine Principles(Management Level)			
Knowledge, understanding and proficiency	**Recommendation of working group regarding the outcome and objective.**	**Rationale**	**Action required**
Outcome1: Apply the fundamental properties of thermodynamics to a process	**Keep**	**Relevant**	**None**
1.1Relationship between p, V and T for polytropic and adiabatic processes	Keep	Relevant	None
1.2 Work transfer for reversible processes	Keep	Relevant	None
1.3 Heat transfer for reversible processes	Keep	Relevant	None
1.4 Specific heat at constant pressure and constant volume	Keep	Relevant	None
1.5 Change of entropy of a perfect gas	Keep	Relevant	None
1.6 P-V and T-S diagrams	Keep	Relevant	None
1.7 Avogadro's Law	Keep	Relevant	None
1.8 Universal Gas Constant	Keep	Relevant	None
Outcome 2: Evaluate and apply marine heat engine cycles	**Contextualise**	**It is important to make sure Cadets clearly understand how this outcome relates to work at sea and it is essential to make sure that this context is given with reference to**	**Ensure this is put into context for relevant equipment on board in the current/ future environment.**

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		current and future seagoing technologies and practices.	
2.1 Second law of thermodynamics	Keep	Relevant	None
2.2 Comparison of the Carnot cycle with ideal heat engines, its thermal efficiency and the application of Carnot's principle to the second law of thermodynamics	Keep	Relevant	None
2.3 Comparison of the Carnot cycle with ideal heat engine cycles	Keep	Relevant	None
2.4 Ideal engine cycles described using P-V and T-S diagrams and practical counterparts applied to Marine engines	Keep	Relevant	None
2.5 Thermal efficiency, indicated and brake mean effective pressure, work done and air standard efficiency of Ideal cycles	Keep	Relevant	None
2.6 Thermal efficiency, work, and heat transfer of Gas Turbines	Keep	Relevant	None
Outcome 3: Calculate heat transfer through complex systems	**Keep**	**Relevant**	**None**
3.1 Fourier's Law for conductive heat transfer	Keep	Relevant	None

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3.2 Heat transfer through thick cylinders, single and double lagged pipes, spheres, and hemispherical ends of cylinders	Keep	Relevant	None
3.3 Heat transfer through boundary layers	Keep	Relevant	None
3.4 Overall heat transfer coefficient 'U' for composite flat plates and composite lagged pipes, using thermal conductivity and surface heat transfer coefficient	Keep	Relevant	None
3.5 Stefan Boltzmann constant	Keep	Relevant	None
3.6 Black body' radiation and 'emissivity factor	Keep	Relevant	None
Outcome 4: Calculate the properties of constituent parts during combustion of marine fuels	**Keep**	**Relevant**	**None**
4.1 Combustion of fuel by mass and volume	Keep	Relevant	None
4.2 Stoichiometric, insufficient, and actual air supply and the proportional gravimetric constituents of a fuel from flue gas analysis	Keep	Relevant	None
4.3 Higher and Lower Calorific Values of fuels and the heat energy released by the various constituents	Keep	Relevant	None

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4.4 Dalton's laws to stoichiometric and other mixtures of gaseous fuels and air	Keep	Relevant	None
4.5 Dew point' of water vapour from flue gas analysis	Keep	Relevant	None
4.6 Heat carried away in flue gases and heat transfer from gas to water heat exchangers	Keep	Relevant	None
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	Add an outcome to: "Calculate the power output for non-combustible future marine fuels". Looking beyond the burning of diesel-based fuel.	As technology advances, we will move beyond traditional fuel cells, it is essential that we ensure that future seafarers are prepared for these changes.	Add this outcome to the module and suggest its addition as part of the IMO's STCW Comprehensive Review.
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	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

		these skills needs to be taught where relevant.	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.