# Proposal to modernise the Methodology of Teaching, Assessment/ Examination

| Marine Engineering - STCW III/1 CoC | | | |
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| **Competency/ Module: Marine Engineering: Applied Thermodynamics (Management Level)** | | | |
| **Knowledge, understanding and proficiency** | **Recommendation of working group regarding the outcome and objective.** | **Rationale** | **Action required** |
| **Outcome1: Analyse the use of multistage reciprocating air compressors** | **Keep** | **Relevant** | **None** |
| 1.1 P-V diagrams to describe ideal and actual cycles for multistage compression | Keep | Relevant | None |
| 1.2 Effect of intercooling between stages by calculating heat transfer during compression and cooling | Keep | Relevant | None |
| 1.3 Work transfer for ideal and actual cycles including clearance for multistage compression | Keep | Relevant | None |
| 1.4 Isothermal efficiency | Keep | Relevant | None |
| 1.5 Indicated and input power requirements | Keep | Relevant | None |
| **Outcome 2: Apply the concept of reverse heat engine to refrigeration and recognise the properties of common refrigerants** | **Keep** | **Relevant** | **None** |

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| 2.1 Concept of entropy to refrigeration using tables and formulae | Keep | Relevant | None |
| 2.2 Vapour compression cycles and reversed Carnot cycle using p-H and T-S diagrams | Keep | Relevant | None |
| 2.3 Effects of superheating and undercooling and describe the effects using p-H and T-S diagrams | Keep | Relevant | None |
| 2.4 COP of actual plant and compare to COP of reversed Carnot cycle | Keep | Relevant | None |
| 2.5 Use of intermediate cooling and evaluate the application of intermediate cooling by flash chamber | Keep | Relevant | None |
| **Outcome 3: Determine the efficiency of steam plant and power from a velocity and a pressure compound steam turbine** | **Keep** | **This outcome is still relevant - with emissions becoming a greater focus, more and more methods of waste heat recovery are being looked at. One of the most common methods is to use a turbo generator, so a small steam driven generator. While the size of the turbines is small the principles are the same.** | **None** |

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| 3.1 Heat energy distribution in a boiler and compile a heat balance account. | Keep | Relevant | None |
| 3.2 Thermal efficiency | Keep | Relevant | None |
| 3.3 H-S and T-S charts to evaluate and analyse the basic Carnot and Rankine cycles including improvements from superheating, reheating and feed heating | Keep | Relevant | None |
| 3.4 Steady flow energy equation to steam nozzles to calculate throat and exit velocities | Keep | Relevant | None |
| 3.5 Reasons for change of nozzle form and convergent and convergent/divergent sections | Keep | Relevant | None |
| 3.6 Blade velocity diagrams for impulse and reaction turbines, kinetic and leaving losses | Keep | Relevant | None |
| 3.7 Stage power, stage efficiency and stage axial thrust for a velocity and pressure compounded turbines and the number of stages from given steam conditions for a reaction turbine | Keep | Relevant | None |
| **Outcome 4: Solve problems involving fluid mechanics in pipes, pumps, meters and jets** | **Keep** | **Relevant** | **None** |
| 4.1 Flow velocities and pressures in parallel and tapering pipe work systems and Bernoulli's equation | Keep | Relevant | None |
| 4.2 Venturi meters | Keep | Relevant | None |

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| 4.3 Forces on pipe bends | Keep | Relevant | None |
| 4.4 Motion of hydraulic jets in relation to projectile theory | Keep | Relevant | None |
| 4.5 Power for centrifugal pumps and evaluate performance | 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 & 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 | 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 |

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| | | 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. | shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed. |