

ANNEX

**Course Module: 2 Months Bridging Course for A TS Candidates
Appearing for MEO Class II Examination
DETAILED TEACHING SYLLABUS**

S.No	Subject	Hrs.
1.0	Mechanics & Hydrodynamics	80
1.1	Statics. <ul style="list-style-type: none">➤ Equilibrium of Non-Coplanar forces➤ Rapson slide➤ Problems	5.0 2.0 1.0 2.0
1.2	Friction. <ul style="list-style-type: none">➤ Static & Kinetic friction➤ Co-efficient of friction➤ Friction between solid dry surfaces➤ Motion up & down, inclined plane➤ Friction of square & V-threads➤ Friction in pivots & collars, conical bearings & thrust bearings plates➤ Friction in cone clutches & centrifugal clutches➤ Work done against friction➤ Problems	10.0 0.5 0.5 0.5 1.0 0.5 2.0 2.0 1.0 2.0
1.3	Kinematics <ul style="list-style-type: none">➤ Inertia➤ Linear & angular motion with acceleration➤ Uniform acceleration & deceleration➤ S.H.M. & uniform velocity➤ Cams & types of cams & followers➤ Turning moment diagrams➤ Problems	10.0 0.5 1.0 0.5 1.0 3.0 1.0 3.0
1.4	Dynamics. <ul style="list-style-type: none">➤ Work & Power➤ Constant force & force with Linear variation➤ Energy, Potential & Kinetic Energy of Translation & rotation➤ Newton's law of motion➤ Conservation of momentum➤ Centrifugal force & its application to conical pendulum➤ Unloaded Governor, curved tracks & Machine parts➤ Stress in rim due to centrifugal action➤ Acceleration of connected bodies➤ Effect of Simple air resistance on motion under the effect of gravity➤ Torque equation➤ Flywheels➤ Impulsive forces	18.0 0.5 0.5 1.0 0.5 0.5 1.0 1.0 1.0 1.0 1.0 1.0 0.5 0.5

	<ul style="list-style-type: none"> ➤ S.H.M. simple pendulum ➤ Simple vibration ➤ Dynamic balancing of masses rotating in one plane ➤ Basic dynamics of engine mechanism ➤ Problems 	<p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>4.0</p>
1.5	Machines <ul style="list-style-type: none"> ➤ Screw jack ➤ Warwick Screw ➤ Worm driven chain blocks ➤ Single & double purchase crab winches ➤ Reduction Gearing ➤ Problems 	<p>10.0</p> <p>1.0</p> <p>1.0</p> <p>2.0</p> <p>2.0</p> <p>2.0</p> <p>2.0</p>
1.6	Stress & Strain <ul style="list-style-type: none"> ➤ Principal stresses ➤ Stresses on Oblique planes ➤ Complimentary shear and stresses ➤ Strength of simple connections such as cottored or screwed Joints ➤ Resilience due to direct stress ➤ Suddenly applied loads ➤ Effect of direct loading and of temperature changes on compound members ➤ Strain Guages ➤ Problems 	<p>10.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>2.0</p>
1.7	Beams. <ul style="list-style-type: none"> ➤ Neutral Axis of beams of simple action ➤ Use of deflection formula ➤ Problems 	<p>5.0</p> <p>1.5</p> <p>1.5</p> <p>2.0</p>
1.8	Bernoulli's equation & Application <ul style="list-style-type: none"> ➤ Blade diagrams of centrifugal pump ➤ Venturimeter ➤ Force exerted by jet. 	<p>2.0</p> <p>1.0</p> <p>0.5</p> <p>0.5</p>
1.9	Hydraulics <ul style="list-style-type: none"> ➤ Full bore flow of liquid through pipes under constant head ➤ Flow through orifice ➤ Co-efficient of velocity ➤ Contraction of area and discharge ➤ Condition of maximum power transmission ➤ Time required to empty various reservoir of various shapes ➤ Flow from one reservoir to the other reservoir ➤ Inflow and outflow ➤ Fluid friction, viscous & Laminar flow ➤ Viscous flow in pipes ➤ Vortex motion and radial flow 	<p>10.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>0.5</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>0.5</p> <p>1.0</p>
2.0	Thermodynamics & Heat Transmission	80
2.1	Gases <ul style="list-style-type: none"> ➤ Avagadro's hypothesis 	<p>6.0</p> <p>1.0</p>

	<ul style="list-style-type: none"> ➤ Universal Gas Constant ➤ Dalton's law of partial pressure and applications to mixtures of Gases and vapours such as the effect of air leakage into Condensers. ➤ Determination of γ from graphs connecting P & V. Proof of the formulae $C_p - C_v = R/J$ ➤ Problems 	<p>1.0</p> <p>2.0</p> <p>1.0</p> <p>1.0</p>
2.2	<p>Gas cycles</p> <ul style="list-style-type: none"> ➤ Use of entropy charts ➤ Open closed cycles for gas turbines ➤ Carnot's Cycle ➤ Entropy & Irreversibility ➤ Applied Problems 	<p>6.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>2.0</p>
2.3	<p>Steam cycles & Properties of Steam</p> <ul style="list-style-type: none"> ➤ Carnot's cycle of steam & ideal efficiency ➤ Rankin cycle with dry saturated steam & superheated steam. ➤ Feed pump work ➤ Rankin efficiency ➤ Cycle efficiency ➤ Isentropic efficiency ➤ Work ratio ➤ Reheating & Regenerative ➤ Feed heating & thin effect on thermal efficiency ➤ Saturated steam, dry wet, dryness fraction, superheated steam, internal energy, Enthalpy, specific volume. ➤ Throttling, separating, & Throttling calorimeters, ➤ Use of steam tables with changes of entropy ➤ Problems 	<p>14.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>0.5</p> <p>0.5</p> <p>0.5</p> <p>0.5</p> <p>1.0</p> <p>1.0</p> <p>2.0</p> <p>1.0</p> <p>2.0</p> <p>2.0</p>
2.4	<p>Steam Plant</p> <ul style="list-style-type: none"> ➤ Thermal Mechanical & overall efficiency of prime movers ➤ Boiler efficiency ➤ Heat balance for engine ➤ Modified Rankin cycle for steam engines ➤ Hypothetical indicator diagram ➤ Mean effective pressure & work transfer ➤ Change in dissolved solids in boilers & evaporation due to contaminated feed and effect of blowing down. ➤ Elementary principle of steam turbine including simple velocity diagram for impulse and reaction turbine. Force & work done on blades. ➤ Isentropic efficiency ➤ Enthalpy drop in turbines ➤ Flow through nozzles excluding proof of critical pressure ratio ➤ Effect of thermal efficiency of such modifications as superheating reheating and regenerative feed heating ➤ Use of enthalpy - entropy charts to determine steam conditions at various stages. 	<p>24.0</p> <p>2.0</p> <p>0.5</p> <p>0.5</p> <p>0.5</p> <p>1.0</p> <p>1.5</p> <p>2.0</p> <p>2.0</p> <p>1.0</p> <p>1.0</p> <p>1.0</p> <p>2.0</p> <p>2.0</p>

	<ul style="list-style-type: none"> ➤ Various calculations on evaporator & boiler performance. ➤ Problems. 	2.0 0.5
2.5	Fuel, combustion & Dissociation <ul style="list-style-type: none"> ➤ Definition of fuel & Calorific value ➤ Combustion and equation ➤ Stoichiometric Combustion ➤ Actual combustion ➤ Excess air ➤ Mixture Strength ➤ Dissociation & its effect on I.C. Engine 	10.0 1.0 1.0 2.0 2.0 1.0 2.0 2.0
2.6	Gas Dynamics <ul style="list-style-type: none"> ➤ One Dimensional steady flow of compressible fluids ➤ Isentropic flow ➤ Effect of friction ➤ Flow through nozzles & diffusers ➤ Critical condition ➤ Sub-Sonic, Sonic & supersonic flow ➤ Supersaturated flow of steam ➤ Problems 	10.0 2.0 1.0 1.0 1.0 0.5 1.5 1.0 2.0
2.7	AIR COMPRESSORS <ul style="list-style-type: none"> ➤ Elementary principles & cycles of operation ➤ Calculation of work done ➤ Indicator diagram ➤ Problems. 	5.0 1.0 1.0 1.0 2.0
2.8	REFRIGERATION <ul style="list-style-type: none"> ➤ Vapour compression cycle ➤ Refrigeration effect ➤ Cooling load ➤ Use of tables of properties of refrigerant ➤ Co-efficient of performance ➤ Problems 	5.0 1.0 1.0 0.5 0.5 1.0 1.0
3.0	Controls	40
3.1	Control Systems <ul style="list-style-type: none"> ➤ Introduction to control terms ➤ Block diagram of control system ➤ Closed loop and open loop system ➤ Regulators & servo mechanisms ➤ Use of various control modes ➤ Graphical representation of signals 	6.0 1.0 1.0 1.0 1.0 1.0 1.0
3.2	Position Control <ul style="list-style-type: none"> ➤ The torque proportional to error ➤ Servomechanism ➤ Series & Parallel compensation 	3.0 1.0 1.0 1.0
3.3	Process Control System <ul style="list-style-type: none"> ➤ Automatic closed loop system ➤ Control system Dynamics, characteristics of controllers ➤ Practical pneumatic controller 	3.0 1.0 1.0 1.0

3.4	Analog Computing & Simulation ➤ The use of digital computer in the simulation control system	2.0 2.0
3.5	Transmission ➤ Pneumatic & electric transmission ➤ Suitability of Marine use	3.0 1.5 1.5
3.6	Correcting Unit ➤ Diaphragm actuators ➤ Valve positioners ➤ Piston actuators ➤ Marine boiler - Automatic combustion control	8.0 2.0 2.0 2.0 2.0
3.7	Hydraulic circuit & control ➤ Basic fluid power components ➤ Symbols along with various hydraulic terms ➤ Different type of pumps, relief valve, pressure control valve, N/R valve etc.	6.0 2.0 2.0 2.0
3.8	Hydraulic transmission of power ➤ Hydraulic Motor ➤ Valves ➤ Types of Hydrostatic drives ➤ Types of Hydraulic transmission system ➤ Hydraulic coupling ➤ Application of Control System	9.0 1.0 2.0 2.0 2.0 1.0 1.0
4.0	Electronics	25
4.1	Electron Emission and their applications	02
4.2	Semi Conductors & Diodes: ➤ Types of Semi conductors and their electrical characteristics ➤ Characteristics of Diodes ➤ Diode as a rectifier ➤ Zener diodes	03
4.3	Transistors: ➤ The junction transistor and its basic characteristics ➤ Transistor as a switch and an amplifier and its applications ➤ Full wave & Bridge Rectifiers	05
4.4	Regulated Power Suppliers: ➤ Series Regulators & Shunt Regulators	04
4.5	Operation Amplifier Theory, Linear OP-amp circuits	03
4.6	Industrial Electronics: ➤ Power rectification ➤ Silicon Control rectifier power control ➤ Photo-electric devices ➤ Inverters	04
4.7	Electronic Instruments: ➤ Cathode Ray Oscilloscope ➤ Digital Voltmeters and frequency-meters ➤ Multimeters, ➤ Voltmeter and signal Generators	04

5.0	Maritime Legislations	15
5.1	➤ Basic safety concept on board a merchant vessel & operational knowledge of the relevant IMO instruments like SOLAS, MARPOL, LOADLINE, TONNAGE, COLREG & STCW with latest amendments	07
5.2	➤ Statutory certificates and documents to be provided on board for safe trading of vessel	06
	➤ Procedures for obtaining Statutory/Class certificates and Documents	
	➤ Surveys special / Immediate / annual to be conducted on ocean going ships, related conventions for the Certificates, period of validity	
	➤ Definition of flag state / Port State	
	➤ Port State control inspection, Implication of ship's detention	
5.3	➤ ISM Code	02
	➤ Issue of DOC /SMC and maintenance of SMC	