

**GOVERNMENT OF PAKISTAN**



**PAKISTAN MARINE ACADEMY**

**SHIP TECHNOLOGY  
FOR  
MARINE ENGINEERING CADETS**

## **PREFACE**

1. In the nineteenth century, the invention and installation of steam engine on board marine craft paved a way towards specialized Marine Engineering Profession. Basically the role of Marine Engineers was restricted to operation and maintenance of marine machinery and equipment, which required theoretical and practical knowledge to some extent.
2. With the advancement in technology in ship building, propulsion and control system, safety of life and protection of marine environments, the marine Engineers are required to have an extensive structured, theoretical and practical knowledge to meet the latest developments in the Maritime field.
3. This syllabi has been developed for the training of Marine Engineers, to establish the fundamental principal as foundation of the maritime work force with respect of knowledge and skill required for effective operation and maintenance of shipboard functions. It will enable the National Maritime Training system to compete with the International Maritime Filed in a compatible and honorable manner.

**CHIEF ENGR. TAHIR JAMIL  
O.I/C. MARINE NGINEERING  
DEPARTMENT.**

**TERM WISE BREAK-UP OF CREDIT HOURS AND MARKS**  
**FOR REVISED SYLLABI EFFECTIVE FROM JANUARY, 2005**

**PAKISTAN MARINE ACADEMY, KARACHI**

COURS E NO.	SUBJECT	1 <sup>ST</sup> TERM		2 <sup>ND</sup> TERM		3 <sup>RD</sup> TERM		4 <sup>TH</sup> TERM		TOTAL	
		Credit Hours	Max Marks	Credit Hours	Max Marks	Credit Hours	Max Marks	Credit Hours	Max. Marks	Credit Hours	Max. Marks
E-401	Applied Mechanics (A.M)	21	100	21	100	32	100	32	100	106	400
E-402	Heat Engines (Applied Thermodynamics) (T.D)	21	100	21	100	21	100	21	100	84	400
E-403	Machine Drawing (Engg. Drawing) (M.D)	43	100	43	100	43	100	43	100	172	400
E-404	Electro Technology (E.T)	21	100	21	100	21	70	21	70	84	340
E-405	Instrumentation & control system (I.C.S)	-	-	-	-	11	30	11	30	22	60
E-406	Internal Combustion Engines (I.C.E.K)	21	-	21	-	21	100	21	100	84	200
E-407	General Engineering Knowledge (G.E.K)	32	100	32	100	32	100	32	100	128	400
E-408	Naval Architecture (N.A)	7	-	7	-	14	70	14	70	42	140
E-409	Ship Construction (S.C)	4	-	4	-	8	30	8	30	24	60
E-410	Workshop Theory (W.TH)	21	75	21	75	21	75	21	75	84	300
E-411	Workshop Practice (W.PR)	32	25	32	25	43	25	43	25	150	100
E-412	Watch Keeping (W.K)	-	-	-	-	-	-	11	-	11	-
E-413	Engine Plant Simulator (E.P.S)	-	-	-	-	11	-	11	-	22	-

# E-401 APPLIED MECHANICS

## SCHEME OF STUDIES

### FIRST YEAR:

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01-A.M</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>TERM -II</b>	<b>02-A.M</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
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<b>Total</b>				<b>200</b>
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### SECOND YEAR:

<b>TERM -III</b>	<b>03-A.M</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
<b>TERM -IV</b>	<b>04-A.M</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
				-----
<b>Total</b>				<b>200</b>
				-----

**TERM -I**                      **01-A.M**                      **CREDIT HOURS (21.0)**  
**E-401/01-AM**

<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A- STATICS</b>	<b>07</b>
<b>A.1</b>	Resultant and equilibrate triangle of forces, polygon of forces.	
<b>A.2</b>	Concurrent and parallel forces, Bow's Notation, component of a force, non coplanar forces.	
<b>A.3</b>	Slings, jib cranes, reciprocating engine mechanism.	
	<b>B- KINEMATICS</b>	<b>6.5</b>
<b>B-1</b>	Speed, linear velocity and acceleration velocity time graph	

B-2	Angular velocity and acceleration, relative velocity, instantaneous centre.	
B-3	Projectiles.	
<b>C – DYNAMICS</b>		<b>6.5</b>
C-1	Mass, weight, force of gravity, newton's laws of motion.	
C-2	Inertia, acceleration force atwoods machine, fletcher's trolley	
C-3	Impulse and momentum, turning moment.	

**REVISION OF TERM**

**1.0**

**21.0**

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOK	AUTHOR
1.	Reeds Applied Mechanics for Engineers (Vol. II)	William Embleton

**TERM -II                      02-A.M                      CREDIT HOURS (21.0)**  
**E-401/02-AM**

SUB. SECTION	TOPICS	CRIDET HOURS
<b>D – WORK, POWER AND ENERGY</b>		<b>6.5</b>
D-1	Work graphical representation power, power transmission.	
D.2	Transmission of power by belt. transmission of power by gear.	
D-3	Kinetic and potential energy.	
<b>E – CENTRIPETAL ACCELERATION</b>		<b>7.0</b>
E-1	Centripetal and centrifugal force	
E.2	Side skidding and overturning of vehicles.	
E-3	Balancing conical pendulum governors	
E-4	Stress in flywheel rims. Simple harmonic motion, simple Pendulum. vibration of spring.	
<b>F – SLIDING FRICTION</b>		<b>6.5</b>
F-1	Coefficient of friction inclined planes.	

- F-2 Parallel forces to pull forces up and down.  
horizontal and least forces.
- F-3 Efficiency of square thread.

**REVISION OF TERM**

**1.0**

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**21.0**

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOK	AUTHOR
1.	Reeds Applied Mechanics for Engineers (Vol. II)	William Embleton

**TERM -III**

**03-A.M**

**CREDIT HOURS (32.0)**

**E-401/03-AM**

S.NO.	TOPICS	CRIDET HOURS
	<b>G – MOMENTS</b>	<b>9.5</b>
G.1	Moment of a force. first moment and applications.	
G.2	Couple, centre of gravity.	
G.3	Second moments, theorem of parallel axis.	
	<b>H – LIFTING MACHINES</b>	<b>11.0</b>
H.1	Velocity Ratio, Mechanical Advantage, efficiency.	
H.2	Rope pulley blocks.	
H.3	Wheel and axle.	
H.4	Differential pulley Blocks, Worm and worm wheel	
H.5	Screw jack, warwick screw.	
H.6	Screw jack, Hydraulic jack.	
	<b>I – STRESS AND STRAIN</b>	<b>10.0</b>
I.1	Stress and strain, Hook’s law.	
I.2	Working stress, Factor of safety.	
I.3	Modulus of elasticity, tensile test.	
I.4	Compound bars.	
I.5	Restricted expansion.	
I.6	Resilience, Suddenly applied	

And shock loads.

**REVISION OF TERM**

**1.5**

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**32.0**

**RECOMMENDED BOOKS**

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**S.NO.                      NAME OF BOOK                      AUTHOR**  
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1.                      Reeds Applied Mechanics  
                            for Engineers  
                            (VOL. II)    William Embleton

**TERM -IV                      04-A.M                      CREDIT HOURS (32.0)**  
**E-401/04-AM**

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**SUB. SEC                      TOPICS                      CREDIT HOURS**  
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**K - BENDING OF BEAMS                      8.0**

**K-1**                      Conditions of equilibrium  
**K-2**                      Simply supported beams and  
                            Cantilever.  
**K-3**                      Concentrated and distributed  
                            Loading.  
**K-4**                      Shearing Force and bending  
                            Moment diagrams.  
**K-5**                      Neutral Axis.  
**K-6**                      Fundamental bending equation  
**K-7**                      Modulus of section  
**K-8**                      Deflection  
**K-9**                      Combined bending and direct stress.

**L - TORSION OF SHAFTS                      7.0**

**L-1**                      Fundamental torsion equation  
**L-2**                      Relationship between torque,  
                            Stress and power.  
**L-3**                      Torsional resilience.  
**L-4**                      Maximum and mean Torque.  
**L-5**                      Coupling bolts.  
**L-6**                      Reciprocating engine mechanism

**M - HYDRAULICS                      7.5**

**M-1**                      Density, specific gravity.  
**M-2**                      Volumetric expansion.  
**M-3**                      Pressure head, pressure on

**M-4** Immersed surfaces.  
Transmission of power,  
Centre of pressure.

**N - HYDRO DYNAMICS**

**8.0**

**N-1** Flow through pipes.  
**N-2** Bernaulli's equation.  
**N-3** Effect of Friction.  
**N-4** Meter Coefficient,  
Impact of water Jet  
**N-5** Centrifugal pump.

**REVISION OF TERM**

**1.5**

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**32.0**

**RECOMMENDED BOOKS**

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**S.NO.**

**NAME OF BOOK**

**AUTHOR**  
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**1.**

Reeds Applied Mechanics  
for Engineers (V01. II)

William Embleton

**E-402 APPLIED THERMODYNAMICS/**  
**HEAT ENGINES**

**SCHEME OF STUDIES**

**FIRST YEAR:**

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01-T.D</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>TERM -II</b>	<b>02-T.D</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
			<b>Total</b>	<b>200</b>

**SECOND YEAR:**

<b>TERM –III</b>	<b>03-T.D</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>TERM –IV</b>	<b>04-T.D</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
			<b>Total</b>	<b>200</b>

**TERM -I**                      **01-T.D**                      **CREDIT HOURS (21.0)**  
**E-402/01-T.D**

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<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A – UNITS AND COMMON TERMS</b>	<b>5.0</b>
<b>A-1</b>	Mass, Force, weight	
<b>A.2</b>	Works, Power, Energy	
<b>A-3</b>	Volume, Specific volume, density.	
<b>A-4</b>	Pressure, absolute pressure Gauge pressure.	
<b>A-5</b>	Temperature, absolute temperature	
<b>A.6</b>	System, boundary and surroundings	
	<b>B – HEAT</b>	<b>5.0</b>
<b>B-1</b>	Heat and work energy, Inter conversion	
<b>B-2</b>	Mechanical equivalent of heat	

<b>B-3</b>	Specific Heat of solids and liquids.	
<b>B- 4</b>	Calorimetry	
<b>B-5</b>	Latent Heat, fusion and evaporation	
	<b>C- THERMAL EXPANSION</b>	<b>5.0</b>
<b>C-1</b>	Expansion of metals	
<b>C-2</b>	Linear, superficial, cubical expansions.	
<b>C-3</b>	Expansion of liquids, apparent cubical expansion	
<b>C-4.</b>	Restricted thermal expansion	
	<b>D- HEAT TRANSFER</b>	<b>5.0</b>
<b>D-1</b>	Conduction and Co-efficient of Thermal conductivity.	
<b>D-2</b>	Conductance of composite Walls	
<b>D-3</b>	Convection and convective heat Transfer coefficient.	
<b>D-4.</b>	Over all heat transfer Coefficient 'U'	
<b>D-5</b>	Radiation, Stefan Boltzman law	
	<b>REVISION OF TERM</b>	<b>1.0</b>
		<hr/>
		<b>21.0</b>

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1.	Heat and Heat Engines for Marine Engineers (Reeds Series Vol. III)	W. Embleton
2.	Basic Engineering	Rayner & Joel

**TERM -II                      02-T.D                      CREDIT HOURS (21.0)**  
**E-402/02-T.D**

<b>SUB-SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>E -LAW OF PERFECT GASES</b>	<b>5.0</b>
<b>E-1</b>	Boyle's, Charle's law	
<b>E-2</b>	Characteristic gas equation $PV= mRT$	
<b>E-3</b>	Specific and Universal gas constant.	
<b>E-4</b>	Avogadro's Law and Dalton's law of Partial pressures	
<b>E-5</b>	Specific heats of gases Relationship and Ratio of specific heats.	
<b>E-6</b>	Internal Energy and non-flow energy equation	
	<b>F –EXPANSION AND COMPRESSION OF PERFECT GASES.</b>	<b>5.0</b>

<b>F-1</b>	Isothermal, adiabatic Polytropic process	
<b>F-2</b>	Relationship between pressure, temperature and volume in adiabatic and polytropic processes.	
<b>F-3</b>	Work transfer in non flow process (closed system)	
<b>F-4</b>	Relationship between heat energy supplied and work done.	

**G-INTERNAL COMBUSTION ENGINE 5.0**  
**ELEMENTARY PRINCIPLES**

<b>G-1</b>	Cycles of operation, 4 stroke and 2 stroke engines
<b>G-2</b>	Timing diagrams.
<b>G-3</b>	Indicator diagrams and engine indicator
<b>G-4</b>	Mean effective pressure
<b>G-5</b>	Indicated and brake power, thermal efficiency and specific fuel consumption.

**H-IDEAL CYCLES 5.0**

<b>H-1</b>	Ideal cycles and ideal thermal efficiency.
<b>H-2</b>	Constant volume, diesel, dual combustion and carnot cycle

**REVISION OF TERM 1.0**

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**21.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1.	Heat and Heat Engines for Marine Engineers (Reeds Series Vol. III)	W. Embleton
2.	Basic Engineering	Rayner & Joel

**TERM -III 03-T.D CREDIT HOURS (21.0)**  
**E-402/03-T.D**

<b>S.NO.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>I – RECIPROCATING AIR COMPRESSOR</b>	<b>6.0</b>
<b>I.1</b>	Reciprocating air Compressor. Compression ratio, compression And delivery periods.	
<b>I.2</b>	Effect of clearance volume, Volumetric efficiency P-V Diagram	
<b>I.3</b>	Work done on compressor per cycle and compressor power.	

<b>I.4</b>	Multistage compression, effect of inter-cooling, calculation on volume delivered.	
	<b>J – STEAM</b>	<b>6.0</b>
<b>J.1</b>	Saturation pressure and temperature of steam, effect of pressure on saturation temperature	
<b>J.2</b>	Dry saturated steam, wet steam. dryness fraction. Calculation of specific enthalpy and specific	
<b>J.3</b>	Superheated steam, use of steam table to determine properties of superheated steam.	
<b>J.4</b>	effect of throttling, determination of dryness fraction after throttling, use of throttling and separating calorimeter to determine dryness fraction.	
	<b>K- RECIPROCATING STEAM ENGINE</b>	<b>4.0</b>
<b>K.1</b>	General construction and working cycle.	
<b>K.2</b>	Indicator diagram. Mean effective pressure, power.	
<b>K.3</b>	Thermal efficiency. Rankine cycle.	
	<b>L – TURBINES</b>	<b>4.0</b>
<b>L.1</b>	Impulse and reaction turbine	
<b>L.2</b>	Thermal efficiency of steam turbine.	
<b>L.3</b>	Expansion of steam through Nozzles.	
<b>L.4</b>	Velocity diagram for impulse turbine, Force on blades and power developed.	
<b>L.5</b>	Vector diagram for reaction turbine, Force on blades and power developed.	
	<b>REVISION OF TERM</b>	<b>1.0</b>
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		<b>21.0</b>

### **RECOMMENDED BOOKS**

<b>S.NO:</b>	<b>TOPICS</b>	<b>AUTHER</b>
1.	Heat and Heat Engines for Engineers. (Read series Vol.III)	W. Embleton
2.	Basic Engineering Thermodynamics.	Rayner & Joel

**TERM –IV****04-T.D CREDIT HOURS (21.0)**  
**E-402/04-T.D**

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<b>SUB. SEC</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>M - STEAM BOILERS</b>	<b>6.0</b>
<b>M-1</b>	Types of boilers and their construction.	
<b>M-2</b>	Capacity and equivalent evaporation.	
<b>M-3</b>	Boiler efficiency	
<b>M-4</b>	Boiler feed water, dissolved solids and analysis of feed water.	
	<b>N – COMBUSTION OF FUELS</b>	<b>6.0</b>
<b>N-1</b>	Combustion of fuel, composition Of fuel and chemical reactions.	
<b>N-2</b>	Higher and lower and lower calorific Values of a fuel and analytical Method of determining it.	
<b>N-3</b>	Calculation of O <sub>2</sub> required for Complete combustion. Theoretical Minimum air and excess air supply.	
<b>N-4</b>	Composition of flue gases Orsat apparatus.	
	<b>O – REFRIGERATION</b>	<b>6.0</b>
<b>O-1</b>	Refrigeration cycle. Reversed heat engine or Heat pump cycle. carnot refrigeration cycle and Its coefficient of performance.	
<b>O-2</b>	vapour compression refrigeration cycle basic components and refrigerant . Pressure enthalpy diagram and use of refrigerant Properties tables.	
<b>O-3</b>	Refrigerating effect and refrigeration capacity , power of compressor, Refrigerant flow rate, C.O.P of refrigerator and condenser capacity.	
	<b>P – NUMERICAL PRACTICE.</b>	<b>3.0</b>
<b>P-1</b>	Numerical practice.	
	<b>REVISION OF TERM</b>	<b>1.0</b>
		<hr/>
		<b>21.0</b>

## **RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>TOPICS</b>	<b>AUTHER</b>
1.	Heat and Heat Engines for Engineers (Reeds series Vol.III)	W.Embleton
2.	Basics engineering thermodynamics.	Rayner Joel





**REVISION OF TERM**

**3.0**

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**43.0**

**RECOMMENDED BOOKS**

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<b>S.NO:</b>	<b>TOPICS</b>	<b>AUTHOR</b>
1.	Pictorial Drawing book Macgibbon	James G Holburn
2.	Engineering Drawing for Marine Engineer (Reed's Vol. III)	H.G.Beck

**TERM-III**

**03-M.D**

**CREDIT HOURS (43.0)**

**E-403/03-M.D**

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<b>SUB. SEC.</b>	<b>TOPICS</b>	<b>CRDIT HOURS</b>
	<b>G - TYPICAL FIRST ANGLE ORTHO- GRAPHIC PROJECTION ASSEMBLY OF VARIOUS PARTS.</b>	
<b>G.1</b>	Parallel slide stop valve.	<b>10.0</b>
<b>G.2</b>	Feed check valve.	<b>10.0</b>
<b>G.3</b>	Starting air pilot valve.	<b>10.0</b>
<b>G.4</b>	Automatic valve.	<b>10.0</b>
	<b>REVISION OF TERM</b>	<b>3.0</b>
		----- <b>43.0</b>

**RECOMMENDED BOOK**

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<b>S.NO</b>	<b>NAME OF THE BOOK</b>	<b>AUTHOR</b>
1.	Pictorial Drawing book Macgibbon	James G Holburn
2.	Engineering Drawing for Marine Engineer (Reed's Vol.III)	H.G.Beck

**TERM-IV****04-M.D CREDIT HOURS (43.0)**  
**E-403/04-M.D**

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<b>SUB. SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>H – TYPICAL ORTHOGRAPHIC PROJECTION DRAWINGS.</b>	
<b>H-1</b>	Starting air value.	<b>10.0</b>
<b>H-2</b>	Connecting rod and bearing.	<b>10.0</b>
<b>H-3</b>	Reducing value.	<b>10.0</b>
<b>H-4</b>	Four stroke piston.	<b>10.0</b>
	<b>REVISION OF TERM</b>	<b>3.0</b>
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		<b>43.0</b>

**RECOMMENDED BOOK**

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<b>S.NO</b>	<b>NAME OF THE BOOK</b>	<b>AUTHOR</b>
<b>1.</b>	Pictorial Drawing book Macgibbon	James G Holburn
<b>2.</b>	Engineering Drawing for Marine Engineer (Reed's Vol.III)	H.G.Beck

# E-404 ELECTRO TECHNOLOGY

## SCHEME OF STUDIES

### FIRST YEAR:

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01- E.T</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>TERM -II</b>	<b>02- E.T</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
			<b>Total</b>	<b>200</b>

### SECOND YEAR:

<b>TERM –III</b>	<b>03-E.T</b>	<b>21.0</b>	<b>2.1</b>	<b>70</b>
<b>TERM –IV</b>	<b>04-E.T</b>	<b>21.0</b>	<b>2.1</b>	<b>70</b>
			<b>Total</b>	<b>140</b>

**TERM -I                      01-E.T                      CREDIT HOURS (21.0)**  
**E-404/01-E.T**

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<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
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|-----------|---|------------|
| <b>A.</b> | <b>ELECTRIC CIRCUITS AND OHM'S LAW</b><br>Nature of electricity,<br>Conductors and insulators<br>Resistance, Units of Resistance,<br>Internal Resistance circuits,<br>Law of Resistance and ohm's law | <b>6.0</b> |
| <b>B.</b> | <b>SOURCES OF ELECTRICITY, ELECTRICAL<br/>UNITS WORK, POWER, ENERGY.</b><br>Thermocouple, Photoelectric effect photocell,   | <b>4.0</b> |

Absolute and gravitational units, M.K.S. system  
Work power and Energy.

<b>C.</b>	<b>ELECTRIC CIRCUITS NET WORK THEOREMS</b>	<b>4.0</b>
	Conductance, Conductivity-effect of Temperature on resistance, Value of ALPHA at different temperature, Resistance with temperature, Rheostat, Potentiometer, Kirchoff's Current Law – Kirchoff's voltage law.	
<b>D.</b>	<b>ELECTRIC CURRENT AND CIRCUITS</b>	<b>6.0</b>
	Division of currents in parallel Circuits Grouping of cells-theory of shunt Ammeters-sources of currents, Parallel, circuits complex circuits, Whetstone bridge	
	<b>REVISION OF TERM</b>	<b>1.0</b>
		----- <b>21.0</b>

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1.	Basic Electro technology for Engineers (Vol. VI. S.I. Units)	Edmund G H. Kraal
2.	A text of Technology (S.I.Units)	B.L. Thrawja

**TERM -II                      02-E.T                      CREDIT HOURS (21.0)**  
**E-404/02-E.T**

<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
<b>E.</b>	<b>ELECTRO CHEMISTRY</b> Electrolysis, Electrolytic cells, The Electrochemical equivalent Primary and Secondary cells, the simple voltaic cell. Constructional details of batteries.	<b>5.0</b>
<b>F.</b>	<b>MAGNETISM – ELECTROMAGNETISIM</b> The magnetism and magnetic fields, Flux and flux density, electro magnetism Magnetic circuits. Permeability, Relative	<b>7.5</b>

Permeability ( $\mu_r$ ), absolute permeability ( $\mu_0$ ) Laws of Magnetic force, Field strength, Relation between B,H and I , weber and Ewing Molecular theory, Diamagnetic para magnetic Materials, Magnetic Hysterisis.

**G. ELECTROMAGNETIC INDUCTION 7.5**

**Ac. FUNDAMENTALS**

Relation between Magnetic and Electricity  
 Production of induced emf and current-  
 Faraday's Laws of Electro-magnetic induction  
 Direction of induced emf and current-Lenz's  
 Law Dynamically induced emf-Staticly  
 Induced emf-self induction Mutual induction

**REVISION OF TERM**

**1.0**

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**21.0**

**RECOMMENDED BOOKS**

S.NO.	NAME OF THE BOOK	AUTHOR
1.	Basic Electro Technology for Engineers (Vol. VI. S.I Units)	Edmund G H. Kraal
2.	A text of electrical Technology (S.I.Units)	B.L Thraja

**TERM -III**

**03-E.T**

**CREDIT HOURS (21.0)**

**E-404/03-E.T**

SUB SEC,	TOPICS	CREDIT HOURS
H -	<b>CAPACITANCE – INDUCTANCE.</b> Inductance, Inductive Reactance, Circuit with Pure resistance, Inductor In series-inductor in Parallel. Capacitive Reactance, type of Capacitors – Circuits with Pure capacitance Capacitors in parallel Charging and discharging of capacitors-time constant.	<b>5.0</b>
I -	<b>Ac. MACHINE, Ac. CIRCUITS AND SYSTEMS</b> Ac. Machine construction, Fleming's right hand rule,	<b>7.5</b>

Maxwell's corkscrow rule.  
 The Ac-Wave form cycle. Time  
 Period-frequency – Amplitude  
 Phase – Phase difference –  
 Root mean Square (R.M.S.)  
 Value-Average value-Form  
 Vector –Power factor, Vector  
 Representation of alternating  
 Quantities. Power factor true  
 Circuits, Power factor true  
 Power, apparent power, Power  
 factor improvement Kw, KVA  
 and KVAr power factor Improvement.  
 Electrical distribution system A/C.

**J - THE D.C. MACHINES 7.5**

General construction. The D.C.  
 generator etc. Characteristics  
 and Current effect.  
 Types of generators Permanent  
 magnet and self excited type,  
 series wound Generator-Shunt  
 Wound Generators-Compound  
 wound Generator-Separately  
 Excited Generators-Load Characteristics.  
 Electrical distribution system D/C.

**REVISION OF TERM**

1.0

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 21.0

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	Reeds Basic Electro Technology for Marine	Edmund G. H.Kraal
2.	A. text of Electrical Technology S. I. Units.	B.L Thrawja

**TERM -IV**

**04-E.T**

**CREDIT HOURS (21.0)**

**E-404/04-E.T**

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<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
<b>K-1</b>	<b>K – D. C MOTORS.</b> Motor principle – Comparison Of Generator and Motor Action Fleming Right hand Rule- Significance of back emf, Voltage, current and speed Equation – Torque – speed of D.C Motor-Characteristics of Series Motors Characteristics Of shunt Motors-Compound	<b>7.5</b>
<b>L-1</b>	<b>L- TRANSFORMERS</b> Working Principle of transfer Transformer construction core Type transformer – shell type Transformer – E.M.F.equation- Voltage transformation relation Transformer test, open circuit- Short circuit – estimation of small Transformers – Losses in Transformers- Efficiency – Auto transformers.	<b>5.0</b>
<b>M-1</b>	<b>M- THERMIONIC AND SEMI CONDUCTOR DIODE.</b> Thermionic devices – semi conductor Diode, static characteristic, Diode as rectifier, intrinsic Conductivity, Extrinsic conductivity N – type, Ge, P- type Ge, the P-n Junction, forward bias, Reverse bias, Zener diode Transistor.	<b>7.5</b>
	<b>REVISION OF TERM</b>	<b>1.0</b>
		<hr/> <b>21.0</b>

## RECOMMENDED BOOKS

S.NO	NAME OF THE BOOKS	AUTHOR
1.	Basic Electro Technology For Engineers. Reeds Publication	Edmund G. H.Krall
2.	A Text of Technology (S.I.Units)	B.L. Thrawja

**E-405 INSTRUMENTATION  
AND CONTROL SYSTEMS**

**SECOND YEAR:**

**SCHEME OF STUDIES**

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-III</b>	<b>03-I.C.S</b>	<b>11.0</b>	<b>0.9</b>	<b>30</b>
<b>TERM –IV</b>	<b>04-I.C.S</b>	<b>11.0</b>	<b>0.9</b>	<b>30</b>
			<b>Total</b>	<b>60</b>

**TERM -III                      03-I.C.S                      CREDIT HOURS (11.0)**

**E-405/03-I.C.S**

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<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
<b>A – HISTORY CONTROL THEORY FUNDAMENTALS.</b>		<b>3.0</b>
	History – Economy – Safety Why automation in necessary, Advantages and Disadvantages of automation. Nomenclature of the Instruments, sensors, Telemetry Transducers. Digital and analogue Instruments. Measuring Element, Detecting Element, Open loop and closed loop system.	
<b>B – TEMPERATURE MEASUREMENT.</b>		<b>2.5</b>
	Bimetallic Thermometer, Resistance Thermometer, Thermistor Thermocouple Transducers.	
<b>C – PRESSURE MEASUREMENT</b>		<b>2.5</b>
	Water Manometer, Mercury Thermometer,	

pressure Gauge (Bourdon)  
Piezo electric Transducers.

**D – LEVEL MEASUREMENT** **2.5**

Capacitor Level Gauge, Igema  
Remote water level indicator,  
Pneumerator Level indicator.

**REVISION OF TERM** **0.5**

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**11.0**

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOKS	AUTHOR
1.	Reeds Instrumentation and Control System	Leslie Jackson
2.	Reed's Instrumentation and Control System	L. Jackson Thoman D. Morton

**TERM -IV** **04-I.C.S** **CREDIT HOURS (11.0)**  
**E-405/04-I.C.S**

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**SUB SEC.      TOPICS** **CREDIT HOURS**

**E- OTHER MEASUREMENT.** **4.0**

Speed, techogenerator, photo electric cell, photo transistor, oil in water Sensor, smoke density detector, flame Gas analysis, oxygen analyzer, different Devices and instruments used in Automation, hydraulic, electric and Electronic circuits.

**F- TELEMETERING** **2.5**

Force balance transducer (pneumatic)  
Electro pneumatic transducers,  
Variable contact resistance Transducer.

**G- CONTROL THEORY FUNDAMENTALS** **4.5**

Automatic control system, types of Actual bridge control, oil purification System, instrumentation, calibration Testing and adjustment.  
Operation testing and fault rectification of automatic control system and alarm panel.

**REVISION OF TERM** **0.5**

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**11.0**

## **RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1.	Reed's instrumentation And control system	Leslie Jackson
2.	Reed's instrumentation and control system.	L. Jackson & Thoman D. Morton

**E-406 INTERNAL COMBUSTION  
ENGINES KNOWLDGE**

**SCHEME OF STUDIES**

**FIRST YEAR:**

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM –I</b>	<b>01-ICEK</b>	<b>21.0</b>	<b>-</b>	<b>-</b>
<b>TERM –II</b>	<b>02- ICEK</b>	<b>21.0</b>	<b>-</b>	<b>-</b>

**SECOND YEAR:**

<b>TERM –III</b>	<b>03-ICEK</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>TERM –IV</b>	<b>04- ICEK</b>	<b>21.0</b>	<b>03</b>	<b>100</b>
<b>Total</b>				<b>200</b>

**TERM -I                      01- ICEK                      CREDIT HOURS (21.0)**  
**E-406/01- ICEK**

**BASIC CONCEPT OF EACH TOPIC**

<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A – INTERNAL COMBUSTION ENGINE.</b>	<b>4.0</b>
<b>A.1</b>	Basic Principle	
<b>A.2</b>	Four-Stroke Diesel Engine. Various Parts and operation.	
<b>A.3</b>	Two-Stroke Diesel Engine. Various Parts and operation	
	<b>B – STRUCTURE AND TRANSMISSION</b>	<b>3.0</b>
<b>B.1</b>	Bed plates, column and entablature	

<b>B.2</b>	of various Diesel Engines. Crank Shafts.	
	<b>C – FUEL INJECTION</b>	<b>3.0</b>
<b>C.1</b>	Various types of Fuels and Oils.	
<b>C.2</b>	Storage of Fuels.	
	<b>D – SCAVENGING AND SUPER CHARGING.</b>	<b>3.0</b>
<b>D.1</b>	Scavenging and supercharging.	
<b>D.2</b>	Comparison of Scavenging Process of Four & Two Stroke Diesel Engines	
<b>D.3</b>	Types of super charging	
	<b>E – STARTING AND REVERSING</b>	<b>4.0</b>
<b>E.1</b>	Means of starting Diesel engines	
<b>E.2</b>	Starting air receiver.	
	<b>F – CONTROLS</b>	<b>3.0</b>
<b>F.1</b>	Function of Governor.	
<b>F.2</b>	Bridge control and unattended Machinery.	
	<b>REVISION OF TERM</b>	<b>1.0</b>
		<b>21.0</b>

### RECOMMENDED BOOKS

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	Reed's Motor Engineering Knowledge	Thomas Morton
2.	Marine Diesel Engine C.C. Pounder.	C.C. Pounder
3.	Marine Diesel Oil Engines Southern's	Southern
4.	Running Maintenance of Marine Diesel Engines.	John Lamb
5.	Various Magazines, Periodicals. Engine Manual and Other Marine Engineering books for reference	Various

**TERM -II                      02- ICEK                      CREDIT HOURS (21.0)**  
**E-406/02- ICEK**

### **BASIC CONCEPT OF EACH TOPIC**

<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
<b>G-1</b>	<b>G-VARIOUS SYSTEM IN DIESEL ENGINE</b> Jacket cooling water system	<b>5.0</b>

<b>G-2</b>	Piston cooling water system	
<b>G-3</b>	Sea water cooling system	
	<b>H- FUEL OIL PROPERTIES, PURIFICATION STORAGE ETC.</b>	<b>4.0</b>
<b>H-1</b>	Various physical and chemical properties of diesel and heavy fuel oil used on board.	
<b>H-2</b>	Purification and clarification of fuel oil.	
	<b>1- STARTING AIR COMPRESSORS</b>	<b>2.0</b>
<b>I.1</b>	Starting air compressors two stage and three stage.	
	<b>J- MEDIUM SPEED DIESEL ENGINES</b>	<b>4.0</b>
<b>J-1</b>	Maintenance of Medium speed Diesel engines	
<b>J-2</b>	Developments of medium speed emergency procedure of diesel engines.	
	<b>K- MISCELLANEOUS</b>	<b>5.0</b>
<b>K-1</b>	Safety devices in diesel engines.	
<b>K-2</b>	Fuel Consumption and efficiency of diesel engines.	
<b>K-3</b>	Heat balance	
	<b>REVISION OF TERM</b>	<b>1.0</b>

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**21.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1-	Reed's Motor Engineering Knowledge.	Them's D Morton.
2-	Marine Diesel Engines	C.C.Pounder
3-	Marine Diesel oil engine southern	Souther
4-	Running and Maintenance of Marine diesel engine	John Lamb
5-	Various magazines, Periodicals, Engine manuals.	

SUB SEC,	TOPICS	CREDIT HOURS
	<b>A – INTERNAL COMBUSTION ENGINE.</b>	<b>4.0</b>
A.1	Basic Principle	
A.2	Four-Stroke Diesel Engine. Various Parts and operation.	
A.3	Two-Stroke Diesel Engine. Various Parts and operation	
A.4	Difference between Petrol & Diesel Engine	
A.5	Timing Diagrams of 4 & 2 Stroke D/Es.	
	<b>B – STRUCTURE AND TRANSMISSION</b>	<b>3.0</b>
B.1	Bed plates, column and entablature of various Diesel Engines.	
B.2	Crank Shafts.	
B.3	Cylinder Liners – Material Wear- down	
B.4	Piston and Cross Heads	
	<b>C – FUEL INJECTION</b>	<b>3.0</b>
C.1	Various types of Fuels and Oils.	
C.2	Storage of Fuels.	
C.3	Fuel Injection (Atomization, Turbulence and penetration)	
C.4.	Fuel Injectors and Fuel System	
	<b>D – SCAVENGING AND SUPER CHARGING.</b>	<b>3.0</b>
D.1	Scavenging and supercharging.	
D.2	Comparison of Scavenging Process of Four & Two Stroke Diesel Engines	
D.3	Types of super charging	
D.4	Exhaust gas turbo charger, Basic Principles, Various parts, Function/Operation.	
	<b>E – STARTING AND REVERSING</b>	<b>4.0</b>
E.1	Means of starting Diesel engines	
E.2	Starting air receiver.	
E.3	Safety Features fitted in the System.	
E.4	Various Components in the Systems.	
	<b>F – CONTROLS</b>	<b>3.0</b>
F.1	Function of Governor.	
F.2	Bridge control and unattended Machinery.	

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOKS	AUTHOR
1.	Reed's Motor Engineering Knowledge	Thomas Morton
2.	Marine Diesel Engine C.C. Pounder.	C.C. Pounder
3.	Marine Diesel Oil Engines Southern's	Southern
4.	Running Maintenance of Marine Diesel Engines.	John Lamb
5.	Various Magazines, Periodicals. Engine Manual and Other Marine Engineering books for reference	

**TERM -IV****04- ICEK****CREDIT HOURS (21.0)****E-406/04- ICEK**

SUB SEC,	TOPICS	CREDIT HOURS
	<b>G-VARIOUS SYSTEM IN DIESEL ENGINE</b>	<b>5.0</b>
G-1	Jacket cooling water system	
G-2	Piston cooling water system	
G-3	Sea water cooling system	
G-4	Lubricating oil system	
G-5	Fuel oil system	
	<b>H- FUEL OIL PROPERTIES, PURIFICATION STORAGE ETC.</b>	<b>4.0</b>
H-1	Various physical and chemical properties of diesel and heavy fuel oil used on board.	
H-2	Purification and clarification of fuel oil.	
H-3	Maintenance and repair of purifiers.	
H-4	Storage of fuel on board.	
	<b>1- STARTING AIR COMPRESSORS</b>	<b>2.0</b>
I.1	Starting air compressors two stage and three stage.	
1-2	Parts of starting air compressor. Air Reservoir & mountings.	
I-3	Maintenance and repair of air compressor.	
	<b>J- MEDIUM SPEED DIESEL ENGINES</b>	<b>4.0</b>
J-1	Maintenance of Medium speed Diesel Engines.	
J-3	Developments of medium speed emergency procedure of diesel engines.	
	<b>K- MISCELLANEOUS</b>	<b>5.0</b>

- K-1** Safety devices in diesel engines.
- K-2** Fuel Consumption and efficiency of Diesel engines.
- K-3** Heat balance
- K-4** Power developed and power card, draw card light spring diagram.
- K-5** Maintenance and repairs of diesel engine.
- K-6** Procedure to be adopted for operating main engine Under emergency condition.

**REVISION OF TERM**

**1.0**

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**21.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1-	Reed's Motor Engineering Knowledge.	Them's D Morton.
2-	Marine Diesel Engines	C.C.Pounder
3-	Marine Diesel oil engine southern	Souther
4-	Running and Maintenance of Marine diesel engine	John Lamb
5-	Various magazines, Periodicals, Engine manuals.	

**E-407 GENERAL ENGINEERING**  
**KNOWLEDGE**

**SCHEME OF STUDIES**

**FIRST YEAR:**

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01-G.E.K</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
<b>TERM -II</b>	<b>02-G.E.K</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
			<b>Total</b>	<b>200</b>

**SECOND YEAR:**

<b>TERM –III</b>	<b>03-G.E.K</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
<b>TERM –IV</b>	<b>04-G.E.K</b>	<b>32.0</b>	<b>03</b>	<b>100</b>
			<b>Total</b>	<b>200</b>

**TERM -I                      0I-G.E.K                      CREDIT HOURS (32.0)**  
**E-407/0I-G.E.K**

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<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
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	<b>A- CORROSION</b>	<b>9.0</b>
<b>A.1</b>	Principles of corrosion	
<b>A.2</b>	Electrolytic corrosion	
<b>A.3</b>	Cathodic protection, Sacrificial anodes	
<b>A.4</b>	Boiler defects (deformation, wastage cracks etc).	
<b>A.5</b>	Steam reciprocating engine, basic concept.	
	<b>B-BOILERS</b>	<b>13.0</b>
<b>B.1</b>	Various types of boilers	

	(Scotch, water tube economizers etc)
<b>B.2</b>	Boiler Mountings
<b>B.3</b>	Package Boiler
<b>B.4</b>	Boiler Combustion
<b>B.5</b>	Starting of Boiler from cold
<b>B.6</b>	Boiler Water Test
<b>B.7</b>	Water treatment
<b>B.8</b>	Steam distribution system.
<b>B.9</b>	Construction of boiler gauge glass.
<b>B-10</b>	Maintenance and repair of boiler.

	<b>C-TURBINE THEORY</b>	<b>8.5</b>
<b>C.1</b>	Convergent and divergent theory	
<b>C.2</b>	Impulse and Re-action turbine	
<b>C.3</b>	Gas turbines, gearing	
	<b>REVISION OF TERM</b>	<b>1.5</b>
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		<b>32.0</b>

### RECOMMENDED BOOKS

<b>S.NO:</b>	<b>NAME OF THE BOOKS</b>	<b>AUTHOR</b>
1.	Reeds Vol – viii	Leslie Jackson
2.	Marine Steam Boilers	J.H Nilton
3.	Introduction of Marine Engineering	D.A. Taylor
4.	Various other reference books, periodicals and magazines	Var

**TERM -II                                  02-G.E.K                                  CREDIT HOURS (32.0)**  
**E-407/02-G.E.K**

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>D-Code of safe working practice and M-Notices</b>	<b>9.5</b>
<b>D.1</b>	Working in machinery spaces.	
<b>D.2</b>	Working at boilers.	
<b>D.3</b>	Permit to work.	
<b>D.4</b>	Entering enclosed space or confirmed space.	
<b>D.5</b>	Maintenance of boiler aux. machinery & equipment.	
<b>D.6</b>	Hot work lightening up and shutting down.	
<b>D.7</b>	Hazardous substances.	
<b>D.8</b>	Importance & Significance of M- Notices.	
	<b>E- FUNDAMENTAL OF CONTROL.</b>	<b>4.0</b>
<b>E.1</b>	Description and definition of Automatic Devices.	
<b>E.2</b>	Bridge control of turbine machinery	

	<b>F-FEED SYSTEM AND AUXILIARIES.</b>	<b>9.5</b>
<b>F.1</b>	Open and closed feed system	
<b>F.2</b>	Air pumps, feed heaters Air ejector, feed pumps	
<b>F.3</b>	Flash evaporator, purpose of demister	
<b>F.4</b>	Heat Exchangers, Shell & tube type, plate type	
<b>F-5</b>	Maintenance and repair of cooler and condenser.	

	<b>G - HYDRAULIC POWER TRANSMISSION</b>	<b>9.5</b>
<b>G.1</b>	Principles of hydraulic power transmission	
<b>G.2</b>	Basic equipment & circuit	
<b>G.3</b>	Practical aspects of hydraulic circuit	
<b>G.4</b>	Sources of circuit contamination	
<b>G.4</b>	Fluids, viscosity, temperature and cavitations	
<b>G.6</b>	Applications of hydraulic transmission	
<b>G.7</b>	Deck machinery and cargo handling system.	

	<b>REVISION OF TERM</b>	<b>1.5</b>
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**32.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF THE BOOK</b>	<b>AUTHOR</b>
1.	Reed's ValumeVIII	Leslie Jackson
2.	Marine Steam boilers.	J.H. Milton
3.	Introduction to Marine Engineering	D.A. Taylor
4.	Hydraulic Power Transmission Marine Machinery	C. M. Joy
5.	Various other reference books Periodicals and magazines.	Var.

<b>TERM -III</b>	<b>03-G.E.K</b>	<b>CREDIT HOURS (32.0)</b>
	<b><u>E-407/03-G.E.K</u></b>	

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
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	<b>H – PNEUMATIC SYSTEM.</b>	<b>9.0</b>
<b>H.1</b>	Basic methods of air compression, Reciprocating, rotary vane, rotary Screw type of air compressor.	

- H.2 Condition of air, oil removal, Moisture separators, Vortex Type, Directional Change Type, Coagulating Type.
- H.3 Uses of high-pressure and low Pressure air
- H.4 General Principles of Pneumatic Control
- H.5 Flapper Nozzle, Booster relay
- H-6 Control Valves, Diaphragm Motor

**I – FUEL TECHNOLOGY**

**13.0**

- I.1 Solid fuels, Liquid fuels and fuel plant technology
- I.2 Testing of liquid fuels and oils (Specific gravity, viscosity, calorific value, flash point, classification of dangerous fuels, limits of flammability, explosive limit, HEL, LEL, TLV, Fire point etc.)
- I.3 Viscometer, viscosity of fuel controlled automatically.
- I.4 Theory of combustion of fuel, Air for Combustion
- I.5 Clean Air Act.
- I.6 Precautions while fuel oil bunkering
- I.7 Oil in Navigable Waters Act.
- I.8 Requirements for I.O.P.P. certification

**J – STEERING GEARS.**

**8.0**

- J.1 Steering and receiving telemotors. By pass valve
- J.2 Telemotor fluid, charging system
- J.3 Steering rules
- J.4 Heleshaw pump
- J.5 Electro Hydraulic steering gears, (four Ram Systems).
- J.6 All electric steering gears

**REVISION OF TERM**

**1.5**

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**32.0**

**RECOMMENDED BOOKS**

S.NO:	NAME OF BOOKS	AUTHOR
1.	Reeds Volume VIII	Leslie Jackson
2.	Marine Steam Boilers	J.H. Milton
3.	Introduction to Marine Engineering	D.A. Taylor
4.	Various other references books, periodicals and magazines	Var.

E-407/04-G.E.K

SUB SEC.	TOPICS	CREDIT HOURS
	<b>K – PUMPS AND PUMPING SYSTEM</b>	<b>13.5</b>
<b>K.1</b>	Types of pumps, Reciprocating, Centrifugal Screw, Rotary Vane, Gear pump)	
<b>K.2</b>	Emergency bilge pump	
<b>K.3</b>	Bilge injection valve	
<b>K.4</b>	Suction Head and Cavitations	
<b>K.5</b>	Oily water Separator	
<b>K.6</b>	Bilge and Ballast System	
<b>K.7</b>	Domestic water hydrosphere system.	
<b>K.8</b>	Centralized priming system.	
<b>K.9</b>	Centralized cooling system.	
<b>K.10</b>	Rules for Bilge & ballast system.	
<b>K-11</b>	Maintenance and repair of pumps.	
	<b>L – SHAFTING AND LUBRICATION</b>	<b>4.5</b>
<b>L.1</b>	Stern tubes oil and water lubricated.	
<b>L.2</b>	Thrust Block, its lubrication, film lubrication, and boundary lubrication.	
	<b>M – REFRIGERATION</b>	<b>5.5</b>
<b>M.1</b>	Theoretical Principles, Properties of actual Refrigerant.	
	M.2 Various compression system	
<b>M.3</b>	Condenser, evaporator, valves, Insulations	
<b>M.4</b>	Air conditioning, Humidity and Dew point	
<b>M-5</b>	Maintenance and repair of refrigeration plant.	
	<b>N –FIRE</b>	<b>4.5</b>
<b>N-1</b>	Principle, prevention and Precaution of fires different types of fire extinguishing medium	
<b>N-2</b>	Systems used in extinguishing fire.	
<b>N-3</b>	Fire detection system.	
<b>N-4</b>	Fire man out fit.	
<b>N-5</b>	Breathing Apparatus set	
	<b>O -OIL PURIFICATION</b>	<b>2.5</b>
<b>0-1</b>	Microbial degradation of lub. oil	
<b>0-2</b>	Gravitation, separation filtration of oil fuels and Lubricating oil	
<b>0-3</b>	Various fitting on services & Setting tanks.	
	<b>REVISION OF TERM</b>	<b>1.5</b>
		<b>32.0</b>

## **RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF THE BOOK</b>	<b>AUTHOR</b>
1.	Reeds volume viii	Leslie Jackson
2.	Marine steam boilers	J.H. Milton
3.	Introduction to Marine	D.A. Taylor
4.	Various other references Books, periodicals and magazines.	Various

# E-408 NAVAL ARCHITECTURE

## SCHEME OF STUDIES

<u>FIRST YEAR:</u>	<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
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TERM-I	01-N.A	7.0	-	-
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TERM -II	02-N.A	7.0	-	-
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## SECOND YEAR:

TERM-III	01-N.A	14.0	2.1	70
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TERM -IV	02-N.A	14.0	2.1	70
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	<b>Total</b>			----- <b>140</b> -----
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<b>TERM -I</b>	<b>01-N.A</b>	<b>CREDIT HOURS (7.0)</b>
	<u><b>E-408/01-N.A</b></u>	

### BASIC CONCEPT OF EACH TOPIC

SUB SEC.	TOPICS	CREDIT HOURS
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	<b>A – HYDROSTATICS</b>	<b>1.5</b>
A.1	Density, relative density	
A.2	Pressure exerted by liquid.	
A.3	Load on an immersed plane	
A.4	Centre of Pressure	
	<b>B – DISPLACEMENT T.P.C., COEFFICIENT OF FORMS</b>	<b>2.0</b>
B.1	Arch med's Principle.	
B.2	Displacement, Buoyancy	
B.3	Tones per centimeter immersion	
B.4	Coefficient of Forms.	
B.5	Similar Figures.	

<b>C.1</b>	<b>C – CALCULATION OF AREA AND VOLUME</b> Simpson’s First Rule.	<b>1.0</b>
<b>D.1</b>	<b>D – CENTRE OF GRAVITY</b> Vertical centre of Gravity	<b>2.0</b>
<b>D.2</b>	Longitudinal centre of Gravity	
<b>D.3</b>	Shift in Centre of Gravity due to addition of masses.	
<b>D.4</b>	Shift in centre of Gravity due to movement of masses.	
<b>D.5</b>	Effect of suspended Mass.	
	<b>REVISION OF TERM</b>	<b>0.5</b>
		<b>7.0</b>

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
<b>1.</b>	Reeds Naval Architecture for Marine Engineers (Reed series)	E.A. Stoker

**TERM -II                      02-N.A                      CREDIT HOURS (7.0)**  
**E-408/02-N.A**

**BASIC CONCEPT OF EACH TOPIC**

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>E- STABILITY OF SHIPS</b>	<b>1.5</b>
<b>E-1</b>	Righting moment and righting lever.	
<b>E-2</b>	Transverse Metacentre	
<b>E-3</b>	Metacentric Diagram	
<b>E-4</b>	Inclining Experiment	
	<b>F- TRIM</b>	<b>1.5</b>
<b>F-1</b>	Change in mean draught due to change in density.	
<b>F-2</b>	Change in mean draught due to bulging.	
	<b>G- RESISTANCE</b>	<b>1.0</b>
<b>G-1</b>	Frictional Resistance	
<b>G-2</b>	Residuary Resistance	
<b>G-3</b>	Admiralty Coefficient.	
<b>G-4</b>	Fuel Coefficient.	

	<b>H- PROPELLERS</b>	<b>2.5</b>
<b>H-1</b>	Diameter and pitch or Propeller.	
<b>H-2</b>	Theoretical speed.	
<b>H-3</b>	Apparent stop and true silp.	
<b>H-4</b>	Thrust.	
<b>H-5</b>	Relation between powers.	
<b>H-6</b>	Measurement of pitch.	
	<b>REVISION OF TERM</b>	<b>0.5</b>

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7.0

**RECOMMENDED BOOKS**

<b>S.NO</b>	<b>NAME OF BOOK</b>	<b>AUTHOR</b>
1.	Reeds naval architecture For marine engineers	E.A Stoke

**TERM -III**

**03-N.A**

**CREDIT HOURS (14.0)**

**E-408/03-N.A**

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A – HYDROSTATICS</b>	<b>5.0</b>
<b>A.1</b>	Density, relative density	
<b>A.2</b>	Pressure exerted by liquid.	
<b>A.3</b>	Load on an immersed plane	
<b>A.4</b>	Centre of Pressure	
	<b>B – DISPLACEMENT T.P.C., COEFFICIENT OF FORMS</b>	<b>3.5</b>
<b>B.1</b>	Arch med’s Principle.	
<b>B.2</b>	Displacement, Buoyancy	
<b>B.3</b>	Tones per centimeter immersion	
<b>B.4</b>	Coefficient of Forms.	
<b>B.5</b>	Similar Figures.	
	<b>C – CALCULATION OF AREA AND VOLUME</b>	<b>1.3</b>
<b>C.1</b>	Simpson’s First Rule.	
	<b>D – CENTRE OF GRAVITY</b>	<b>3.5</b>
<b>D.1</b>	Vertical centre of Gravity	
<b>D.2</b>	Longitudinal centre of Gravity	
<b>D.3</b>	Shift in Centre of Gravity due to addition of masses.	
<b>D.4</b>	Shift in centre of Gravity due to movement of masses.	
<b>D.5</b>	Effect of suspended Mass.	
	<b>REVISION OF TERM</b>	<b>0.5</b>

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14



## E-409 SHIP CONSTRUCTION

### SCHEME OF STUDIES

#### FIRST YEAR:

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01-S.C</b>	<b>4.0</b>	<b>-</b>	<b>-</b>
<b>TERM -II</b>	<b>02-S.C</b>	<b>4.0</b>	<b>-</b>	<b>-</b>

#### SECOND YEAR:

<b>TERM-III</b>	<b>03-S.C</b>	<b>7.0</b>	<b>0.9</b>	<b>30</b>
<b>TERM -IV</b>	<b>04-S.C</b>	<b>7.0</b>	<b>0.9</b>	<b>30</b>
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				<b>Total 60</b>
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**TERM -I                      01-S.C                      CREDIT HOURS (4.0)**  
**E-409/01-S.C**

#### **BASIC CONCEPT OF EACH TOPIC**

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A – SHIP TYPES AND TERMS</b>	<b>0.5</b>
<b>A.1</b>	Passenger and Cargo Ships oil tankers, bulk carriers, colliers and container ships	
<b>A.2</b>	Terms in general use.	
	<b>B – STRESS IN SHIP</b>	<b>0.5</b>
<b>B.1</b>	Structural stresses, Hogging and sagging.	

<b>B.2</b>	Local stresses, docking, Panting and pounding.	
	<b>C – WELDING AND SECTIONS USED</b>	<b>0.5</b>
<b>C.1</b>	Electric arc Welding and Riveting	
<b>C.2</b>	Welding positions and sections used	
	<b>D - BOTTOM AND SHIPS FRAMING</b>	<b>1.0</b>
<b>D.1</b>	Double bottom constructions, duct keel and bilge keel.	
<b>D.2</b>	Frames and Beams	
	<b>E – SHELL AND DECKS</b>	<b>0.5</b>
<b>E.1</b>	Deck and Shell planting	
<b>E.2</b>	Hatchways and hatch overs.	
	<b>F – BULKHEADS AND DEEP TANKS</b>	<b>0.5</b>
<b>F.1</b>	Water Tight doors and bulkheads	
<b>F.2</b>	Non Water Tight bulkhead and pillars.	
	<b>REVISION OF TERM</b>	<b>0.5</b>
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		<b>4.0</b>
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**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	Reeds Ship Construction for Marine Engineers (Reed series)	E.A. Stooke
2.	Ships Construction Sketches	Kemp and Yong

**TERM -II                      02-S.C                      CREDIT HOURS (4.0)**  
**E-409/02-S.C**

**BASIC CONCEPT OF EACH TOPIC**

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>G- FORE-END ARRANGEMENTS</b>	<b>1.0</b>
<b>G-1</b>	Steam plating and arrangements To resist painting.	
<b>G-2</b>	Bulbous bow.	
<b>G-3</b>	Anchor and cable arrangement.	

	<b>H- AFTER AND ARRANGEMENTS</b>	<b>1.0</b>
<b>H-1</b>	Transom stern and stern frame.	
<b>H-2</b>	Rudders.	
<b>H-3</b>	Spectacle frame and Propeller frames.	
<b>H-4</b>	Different types of propeller	

	<b>I- DIFFERENT TYPES OF SHIPS</b>	<b>0.5</b>
<b>I.-1</b>	VLCC Tankers and liquid Petroleum gas carries.	
<b>I-2</b>	OBO (ORE/Bulk/Oil) carriers and colliers	

	<b>J- FREE BOARD, TONNAGE AND CLASSIFICATION</b>	<b>1.0</b>
<b>J-1</b>	Freeboard marking and tonnage.	
<b>J-2</b>	Classification of ships	
<b>J-3</b>	Life saving appliances	
<b>J-4</b>	Surveys.	

	<b>REVISION OF TERM</b>	<b>0.5</b>
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**4.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	Reeds Ship Construction for Marine Engineers (Reed series)	E.A. Stooke
2.	Ships Construction Sketches	Kemp and Yong

**TERM -III**

**03-S.C**

**CREDIT HOURS (7.0)**

**E-409/03-S.C**

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<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>A – SHIP TYPES AND TERMS</b>	<b>1.0</b>
<b>A.1</b>	Passenger and Cargo Ships oil tankers, bulk carriers, colliers and container ships	
<b>A.2</b>	Terms in general use.	
	<b>B – STRESS IN SHIP</b>	<b>1.2</b>
<b>B.1</b>	Structural stresses, Hogging and sagging.	
<b>B.2</b>	Local stresses, docking, Panting and pounding.	
	<b>C – WELDING AND SECTIONS USED</b>	<b>1.0</b>
<b>C.1</b>	Electric arc Welding and Riveting	
<b>C.2</b>	Welding positions and sections used	
	<b>D - BOTTOM AND SHIPS FRAMING</b>	<b>1.2</b>
<b>D.1</b>	Double bottom constructions, duct keel and bilge keel.	
<b>D.2</b>	Frames and Beams	
	<b>E – SHELL AND DECKS</b>	<b>1.0</b>
<b>E.1</b>	Deck and Shell planting	
<b>E.2</b>	Hatchways and hatch overs.	
	<b>F – BULKHEADS AND DEEP TANKS</b>	<b>1.2</b>
<b>F.1</b>	Water Tight doors and bulkheads	
<b>F.2</b>	Non Water Tight bulkhead and pillars.	
	<b>REVISION OF TERM</b>	<b>0.4</b>
		<hr/>
		<b>7.0</b>
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**RECOMMENDED BOOKS**

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<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
<b>1.</b>	Reeds Ship Construction for Marine Engineers (Reed series)	E.A. Stooke
<b>2.</b>	Ships Construction Sketches	Kemp and Yong

E-409/04-S.C

SUB SEC.	TOPICS	CREDIT HOURS
	<b>G- FORE-END ARRANGEMENTS</b>	<b>1.5</b>
G-1	Steam plating and arrangements To resist painting.	
G-2	Bulbous bow.	
G-3	Anchor and cable arrangement.	
	<b>H- AFTER AND ARRANGEMENTS</b>	<b>2.0</b>
H-1	Transom stern and stern frame.	
H-2	Rudders.	
H-3	Spectacle frame and Propeller frames.	
H-4	Different types of propeller	
	<b>I- DIFFERENT TYPES OF SHIPS</b>	<b>1.0</b>
I-1	VLCC Tankers and liquid Petroleum gas carries.	
I-2	OBO (ORE/Bulk/Oil) carriers and colliers	
	<b>J- FREE BOARD, TONNAGE AND CLASSIFICATION</b>	<b>2.1</b>
J-1	Freeboard marking and tonnage.	
J-2	Classification of ships	
J-3	Life saving appliances	
J-4	Surveys.	
	<b>REVISION OF TERM</b>	<b>0.4</b>
		<b>7.0</b>

RECOMMENDED BOOKS

S.NO.	NAME OF BOOKS	AUTHOR
1.	Reeds Ship Construction for Marine Engineers (Reed series)	E.A. Stooke
2.	Ships Construction Sketches	Kemp and Yong



- B.1** Definition of Casting Process
- B.2** Tools and equipment for molding
- B.3** Molding processes
- B.4** Molding Sand
- B.5** Gates and Risers
- B.6** Sand conditioning Equipments
- B.7** Sand Testing

**C- PATTERNS FOR CASTINGS 5.0**

- C-1** Type of Patterns
- C-2** Patterns Allowance
- C-3** Patterns colors.
- C-4** Material used in making pattern

**REVISION OF TERM 1.0**

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**21.0**  
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**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOKS	AUTHOR
1.	Workshop Technology Part I, II & III	W.A.J Chapman
2.	General Engineering	Paramount W.P
3.	Manufacturing Processes	My RON L Beggeman.

**TERM -II                      02-W.TH                      CREDIT HOURS 21.0**  
**E-410/02-W.TH**

**SUB SEC, TOPICS CREDIT HOURS**

	<b>D-PRODUCTION OF IRON AND STEEL</b>	<b>6.0</b>
<b>D.1</b>	Blast furnace, Cupola furnace. Electric induction furnace	
<b>D.2</b>	Type of Cast iron	
<b>D.3</b>	Effect of adding alloying elements	

	<b>E-WELDING PROCEDURES</b>	<b>6.0</b>
<b>E.1</b>	Historical Development	
<b>E.2</b>	General welding conditions	
<b>E.3</b>	Welding joints	
<b>E-4</b>	Electrical Resistance Welding Processes	
<b>E.5</b>	Gas Welding processes.	

	<b>F-HOT WORKING OF METAL</b>	<b>3.5</b>
F.1	Rolling	
F.2	Hammer or Smith Forging	
F.3	Drop Forging	
F.4	Press & Upset Forging	
F.5	Pipe & Tube Manufacture	
	<b>G-COLD WORKING OF METAL</b>	<b>4.5</b>
G.1	Effect of Cold Working, Advantages & Limitation	
G.2	Cold working processes	
	<b>REVISION OF TERM</b>	<b>1.0</b>
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		<b>21.0</b>

**RECOMMENDED BOOKS**

S.NO:	NAME OF BOOK	AUTHOR
1.	Workshop Technology Part – I & II	W.A.J Chapman

**TERM -III                      03-W.TH                      CREDIT HOURS 21.0**  
**E-410/03-W.TH**

SUB SEC,	TOPICS	CREDIT HOURS
	<b>H – DRILLING AND BORING MACHINES</b>	<b>6.0</b>
H.1	Introduction to Drilling Boring and Reaming.	
H.2	Classification of Drilling Machine	
H.3	Twist Drills	
H.4	Kinds of Drills	
H.5	Drill Performance.	
	<b>I – LATHE MACHINE</b>	<b>4.5</b>
I.1	Classification of Lathes	
I.2	Lathes Construction & Operation	
I.3	Taper Turning.	
I.4	Lathe Tools	
I.5	Grinding & Setting Tools Processes.	
	<b>J – THREAD &amp; THREAD CUTTING</b>	<b>3.5</b>
J.1	Types of screw Threads	
J.2	Methods of making Threads	
J.3	Cutting Threads on a Lathe	
J.4	Taps & Dies	
	<b>K – GRINDING &amp; GRINDING MACHINE</b>	<b>6.0</b>
K.1	Introduction to Grinding	

- K.2** Introduction to Abrasive
- K.3** Manufacture of Grinding Wheels
- K.4** Bonding Processes
- K.5** Grinding Wheel Selections
- K.6** Grinding Machines
- K.7** Honing and Lapping

**REVISION OF TERM**

**1.0**

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**21.0**

**RECOMMENDED BOOKS**

<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	Workshop Technology Part – III	W.A.J. Chapman.
2.	General Engineering and Workshop Practice	Paramount.
3.	Manufacturing Process	L. Beggeman
4.	Hand outs /Note	Instructor

**TERM -IV**

**04-W.TH**

**CRDDIT HOURS 21.0**

**E-410/04-W.TH**

<b>SUB SEC,</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
	<b>L – ELECTRO FORMING AND COATING PROCESS</b>	<b>5.0</b>
<b>L.1</b>	Material used	
<b>L.2</b>	Advantages and limitations	
<b>L.3</b>	Electro plating processes	
<b>L.4</b>	Hard Surfacing Techniques.	
	<b>M- INSPECTION MEASURING INSTRUMENTS AND GAUGES</b>	<b>5.0</b>
<b>M.1</b>	Introduction to quality control	
<b>M.2</b>	Types of fits	
<b>M.3</b>	Tolerance & allowance	
<b>M.4</b>	classification of Measuring Instruments	
<b>M.5</b>	Linear, Angular Measurement	
<b>M.6</b>	Surface measurements	
<b>M.7</b>	Classification of gages	
<b>M.8</b>	Statistical quality control	
	<b>N – HEAT TREATMENT OF STEEL</b>	<b>5.0</b>
<b>N.1</b>	Introduction to heat Treatment process.	
<b>N.2</b>	Annealing & Normalizing	
<b>N.3</b>	Hardening & its classification	
<b>N.4</b>	Tempering	
<b>N.5</b>	Engineering applications	
	<b>REVISION OF TERM</b>	<b>1.0</b>

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**21.0**

## **RECOMMENDED BOOKS**

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<b>S.NO.</b>	<b>NAME OF BOOKS</b>	<b>AUTHOR</b>
1.	General Engineering and Workshop Practice	Paramount
2.	Various manuals, Books on diesel Engines and Periodicals.	Various
3.	Manufacturing Process	L. Beggeman
4.	Hand outs/Note	Instructor

## E-411 WORKSHOP PRACTICE

### SCHEME OF STUDIES

#### FIRST YEAR:

		<b>CREDIT HOURS</b>	<b>EXAM. DURATION</b>	<b>MAX. MARKS</b>
<b>TERM-I</b>	<b>01-W.PR</b>	<b>32.0</b>	<b>0.75</b>	<b>25</b>
<b>TERM -II</b>	<b>02- W.PR</b>	<b>32.0</b>	<b>0.75</b>	<b>25</b>
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				<b>Total 50</b>
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#### SECOND YEAR:

<b>TERM -III</b>	<b>03-W.PR</b>	<b>43.0</b>	<b>0.75</b>	<b>25</b>
<b>TERM -IV</b>	<b>04-W.PR</b>	<b>43.0</b>	<b>0.75</b>	<b>25</b>
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				<b>Total 50</b>
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**TERM -I                      01-W.PR                      CREDIT HOUR 32.0**  
**E-411/01-W.PR**

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<b>SUB SEC, TOPICS</b>	<b>CREDIT HOURS</b>
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	<b>A-BENCH WORK</b>	<b>20.0</b>
<b>A.1</b>	Filing and drilling	
<b>A.2</b>	Methods of metal cutting	
<b>A.3</b>	Riveting	
<b>A.4</b>	Tapes & dies	
	<b>B-GRINDING</b>	<b>10.5</b>
<b>B.1</b>	Grinding flat surfaces	
<b>B.2</b>	Grinding of cutting tools	
	<b>REVISION OF TERM</b>	<b>1.5</b>

**RECOMMENDED BOOKS**

S. NO:	NAME OF BOOKS	AUTHOR
1.	Workshop Technology	W.A.J Chapman
2.	General Engineering Workshop practice.	Paramount
3.	Models, Jobs as per drawing.	Various

**TERM -II                      02-W.PR                      CREDIT HOUR 32.0**  
**E-411/02-W.PR**

SUB SEC,	TOPICS	CREDIT HOURS
	<b>C-WELDING, SOLDERING AND BRAZIG</b>	<b>25.5</b>
C.1	Gas Welding	
C.2	Electric Welding	
C.3	Tools and methods for Soldering and brazing	
	<b>D-DRILLING</b>	<b>5.0</b>
D.1	Drilling machines speeds and feed, different type of drills and their uses.	
	<b>REVISION OF TERM</b>	<b>1.5</b>
		<b>32.0</b>

**RECOMMENDED BOOKS**

S.NO:	NAME OF THE BOOK	AUTHOR
1.	Workshop Technology	W.A.J.
2.	General Engineering Workshop practice	Paramount
3.	Models, Jobs as per drawing	Var

**TERM -III                      03-W.PR                      CREDIT HOURS 43.0**  
**E-411/03-W.PR**

SUB SEC,	TOPICS	CREDIT HOURS
<b>E – LATHE MACHINE</b>		
E.1	Mechanism of lathe.	7.0
E.2	Metal turning	14.0
E.3	Screw cutting	10.0
E.4	Taper turning and other uses of lathe	10.0
<b>REVISION OF TERM</b>		2.0
		<b>43.0</b>

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOKS	AUTHOR
1.	Workshop Technology	W.A.J.
2.	General Engineering and Workshop Practice	Paramount.
3.	Models, Jobs as per drawing	various.

**TERM -IV                      04-W.PR                      CREDIT HOURS-43.0**  
**E-411/04-W.PR**

SUB SEC,	TOPICS	CREDIT HOURS
<b>F – MAINTENANCE AND REPAIR OF MARINE MACHINERIES.</b>		
F.1	Repair of Valves and pipe Fitting	7
F.2	Repair of pumps.	7
F.3	Repairs of diesel Engines	12
F.4	Boiler and Boiler mountings	6
F.5	Dismantling & Assembly of Diesel Engine (Group Task).	9
<b>REVISION OF TERM</b>		2
		<b>43.0</b>

**RECOMMENDED BOOKS**

S.NO.	NAME OF BOOKS	AUTHOR
1.	Workshop Technology	W.A.J.
2.	Workshop Practice	Paramount
3.	Models, Jobs as per drawing	various.

**E-412 WATCH KEEPING**

## **SECOND YEAR:**

### **SCHEME OF STUDIES**

#### **TERM -IV**

**04-W.K CREDIT HOURS (11.0)**

#### **E-412/04-W.K**

<b>SUB SEC. TOPICS</b>		<b>CREDIT HOURS</b>
1.	Watch keeping duties of junior engineer.	1.5
2.	Port watch keeping duties.	1.0
3.	Anchor watch keeping.	1.0
4.	Sea watch keeping, stand by, maneuvering duties.	1.5
5.	Significance of engine room, log book.	1.0
6.	Significance of oil record book.	1.0
7.	Emergency drills.	1.5
8.	Various ships' certificate & their significance.	2.0
<b>REVISION OF TERM</b>		<b>0.5</b>
		<b>11.0</b>

# E-413 ENGINE PLANT SIMULATOR

## SECOND YEAR:

### SCHEME OF STUDIES

**TERM -III                                      03-E.P.S                                      CREDIT HOURS (11.0)**

#### E-413/03-E.P.S

<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
S.1	System Familiarization; Bilge system, S.W. cooling system, F.W system, Air system.	7.0
S.2	Ship side fitting .	2.0
S.3	Starting of small diesel engine.	1.0
S.4	Starting of air compressor.	0.5
	REVISION OF TERM	0.5
		----- 11.0

**TERM -IV**

**04-E.P.S**

**CREDIT HOURS (11.0)**

**E-413/04-E.P.S**

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<b>SUB SEC.</b>	<b>TOPICS</b>	<b>CREDIT HOURS</b>
S.1	System Familiarization; Fuel system, Steam system, Ballast system.	6.0
S.2	Starting of auxiliary generator engine	1.5
S.3	Parallel operation of generators	1.5
S.4	Automatic control to & from Bridge, Engine room control, manual control.	1.5
	<b>REVISION OF TERM</b>	0.5
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		<b>11.0</b>

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**PAKISTAN MARINE ACADEMY**  
**ENGINEERING WING**

The Engineering faculty of Pakistan Marine Academy, teaches the following subjects:

01. Applied Mechanics
02. Heat Engines (Applied Thermodynamics)
03. Machine Drawing (Engg. Drawing)
04. Electro Technology
05. Instrumentation & control system
06. Internal Combustion Engines
07. General Engineering Knowledge
08. Naval Architecture
09. Ship Construction
10. Workshop Theory
11. Workshop Practice
12. Watch Keeping
13. Engine Plant Simulator

There are no changes made in the following subjects:

01. Applied Mechanics
02. Heat Engines (Applied Thermodynamics)
03. Machine Drawing (Engg. Drawing)
04. Watch Keeping
05. Engine Plant Simulator

There are changes made in the following Subjects:

01. Electro Technology
02. Instrumentation & control system
03. Internal Combustion Engines
04. General Engineering Knowledge
05. Naval Architecture
06. Ship Construction
07. Workshop Theory
08. Workshop Practice

# COMPARISION OF OLD AND NEW SYLLABAI

## GENERAL ENGINEERING

### KNOWLEDGE:

#### FIRST TERM:

*The following topics are added to upgrade the courses as per STCW-95*

- Steam distributing system
- Constructional details of boilers gauge glass
- Maintenance and repair of boilers.

#### SECOND TERM:

The turbine practice topic has been deleted and only basic concept is included in First term. The following are added to upgrade the course as per STCW-95.

#### **Code of safe working practice and M-Notices**

- Working in machinery spaces.
- Working at boilers.
- Permit to work.
- Entering enclosed space or confined space.
- Maintenance of boiler aux. machinery & equipment.
- Hot work lightening up and shutting down.
- Hazardous substances.
- Importance & Significance of M- Notices.
- Deck machinery and cargo handling system.
- Maintenance and repair of condenser and coolers.

#### FOURTH TERM

The following topics are added to upgrade the course as per STCW-95

- Fire detection system.
- Fire man out fit.
- Breathing Apparatus set.
- Maintenance and repair of various pumps.

#### Internal Combustion Engines Knowldge:

#### FOURTH TERM:

*The following items have been added to upgrade the course as per STCW-95.*

- Safe and efficient operation in UMS mode.
- Maintenance and repair of diesel engine.
- Maintenance and repair of air compressors.
- Procedure to be adopted for operating main engine under emergency condition.

## **Naval Architecture:**

### **THIRD TERM**

*The following items have been deleted to upgrade the course as per STCW-95.*

- Simpson's 2<sup>nd</sup> rule.
- Shearing force on bulkhead stiffeners.

### **FOURTH TERM:**

#### **RUDDER THEORY**

- Torque on rudderstock.
- Angle of heel due to force on rudder

## **Ship Construction:**

### **FOURTH TERM:**

*The following items have been added to upgrade the course as per STCW-95.*

Different types of Propellers.

## **WORKSHOP THEORY:**

*The following items have been deleted to upgrade the course as per STCW-95.*

### **SECOND TERM:**

Manufacture of Cast iron and steel.

### **FOURTH TERM:**

## **MAINTENANCE AND REPAIRS OF PUMPS**

- Centrifugal pumps
- Reciprocating pumps
- Screw pumps

## **MAINTENANCE AND REPAIRS OF BOILERS**

- Maintenance and repairs of Scotch Boiler.
- Maintenance and repairs of Water tube Boiler
- Maintenance and repairs of Composite and other boilers.

## **MAINTENANCE AND REPAIRS OF DIESEL ENGINE**

- Maintenance and repairs of Diesel engine.
- Maintenance and repairs of V-Type four stroke engine.
- Maintenance and repairs of two stroke single acting in line and oppose piston engine.
- Maintenance and repairs of Double acting engines.

## **MAINTENANCE AND REPAIRS OF VARIOUS**

- Accessories Oil Purifiers.
- Heaters, condensers and coolers.
- Air compressors.

Refrigeration units.

*The following items have been added to upgrade the course as per STCW-95.*

### **FIRST TERM:**

Material used in making pattern.

### **SECOND TERM:**

- Effect of adding alloying elements
- Historical Development
- General welding conditions
- Type of Cast iron

### **FOURTH TERM:**

## **ELECTRO FORMING AND COATING PROCESS**

- Material used
- Advantages and limitations

- Electro plating processes
- Hard Surfacing Techniques.

## **INSPECTION MEASURING INSTRUMENTS AND GAUGES**

- Introduction to quality control
- Types of fits
- Tolerance & allowance
- classification of Measuring Instruments
- Linear, Angular Mean
- Surface measurements
- Classification of gages
- Statistical quality control

## **HEAT TREATMENT OF STEEL**

- Introduction to heat Treatment process.
- Annealing & Normalizing
- Hardening & its classification
- Tempering
- Engineering applications

## **WORKSHOP PRACTICE:**

*The following items have been deleted to upgrade the course as per STCW-95.*

### **FIRST TERM:**

Cutting screw threads.

### **SECOND TERM:**

Milling machines speeds and feed different type of cutters clearance and cutting angles.

*The following items have been added to upgrade the course as per STCW-95.*

### **FIRST TERM:**

Tapes & dies.

### **SECOND TERM:**

Drilling machines speeds and feed, different type of drills and their uses.

**FOURTH TERM:**

Dismantling & Assembly of Diesel Engine (Group Task).

**ELECTRO TECHNOLOGY**

*The following items have been added to upgrade the course as per STCW-95.*

**SECOND TERM:**

Constructional details of batteries.

**FOURTH TERM:**

Electrical distribution system A/C.  
Electrical distribution system D/C.

**INSTRUMENTATION  
AND CONTROL SYSTEMS:**

*The following items have been added to upgrade the course as per STCW-95.*

**FOURTH TERM:**

Operation testing and fault rectification of automatic control system and alarm panel.