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<td>Material Science &amp; Engineering</td>
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<td>PCME4206</td>
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<td>PCMR4205</td>
<td>Ship Construction</td>
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**Theory Credits** 22

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<td>PCME7201</td>
<td>Machine drawing</td>
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<td>Communication &amp; Interpersonal Skills for Corporate Readiness</td>
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**Sessional Credits** 6

**Total** 28

**Theory Credits** 23

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<td>PCME7204</td>
<td>Material Testing &amp; Heat Power Laboratory plant operation ( Summer Break)</td>
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**Sessional Credits** 4

**Total** 27
Module-I (18 hours)
Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge’s method, Second order partial differential equation
The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.

Module-II (12 hours)
Complex Analysis:
Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,
Complex integration: Line integral in the complex plane, Cauchy’s integral theorem, Cauchy’s integral formula, Derivatives of analytic functions

Module –III (10 hours)
Power Series, Taylor’s series, Laurent’s series, Singularities and zeros, Residue integration method, evaluation of real integrals.

Text books:
   Reading chapter: 18

Reference books:
Module I 

(12 Lectures)
Introduction: Scope of fluid mechanics and its development as a science
Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.
Fluid static Pressure, Pascal’s Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.
Buoyancy and flotation, Archimedes’ principle, stability of immersed and floating bodies, determination of metacentric height.

Module II 

(10 Lectures)
Fluid dynamics: Introduction, Euler’s equation along a streamline, energy equation, Bernoulli’s equation,

Hydraulic Measurements: Water level measurements, velocity measurements, discharge measurements, venturimeter, orifice meter, current meter, pitot tube, orifice, notch and weir.

Module III 

(14 Lectures)


Text Books
1. Fluid Mechanics and hydraulic machines, Modi & Seth
2. Hydraulics fluid machines and fluid machines by S. Ramamrutham

Reference Books:
1. Fluid Mechanics by A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics by Fox and McDonald, Willey Publications
3. Fluid Mechanics by Kundu, Elsevier
4. An Introduction to Fluid Dynamics by G.K.Batchelor, Cambridge University Press
5. Engineering Fluid Mechanics by Garde et. al., Scitech
HSSM3204 Engineering Economics & Costing

Module-I: (12 hours)


Module-II: (12 hours)


Module-III: (12 hours)

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)

Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

Text Books:


Reference Books:

4. Gupta, “ Managerial Economics”, TMH
5. Lal and Srivastav, “ Cost Accounting”, TMH
Module I:

Module II:

Module-III:

Text Books:

Reference Books:
1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma” Organizational Behaviour”, TATA McGraw-Hill.
BSMS1213 Material Science and Engineering

MODULE-I (11 Hours)
Introduction, Classification of Engineering Materials, Engineering properties of materials, Selection of Materials
Mechanical Properties of Materials: Tensile strength, Stress–strain behaviour, Ductile and brittle material, Impact test, Toughness, Hardness test, Fatigue and fatigue test, Creep and Creep test, Fracture

MODULE-II (13 Hours)
Electrical and Electronic materials: Electrical conductivity, Thermal conductivity, Free electron theory, Energy band concept of conductor, insulator & semiconductor.
Superconductor materials: Principles of superconductivity, zero resistivity, Critical magnetic field and critical current density, Type I & II superconductors, Applications of superconductors
Dielectric Materials: Microscopic displacement of atoms and molecules in an external DC electric field, Polarization and dielectric constant, Dielectric susceptibility, polarization mechanisms, Temperature and frequency dependence of dielectric constant, Dielectric breakdown, Ferroelectric materials, Piezoelectrics, pyroelectrics and ferroelectrics, Dielectric materials as electrical insulators

MODULE-III (11 Hours)
Optical materials: optical properties – scattering, refraction, reflection, transmission & absorption, Laser – principles and applications, Optical fibres – principles and applications
Polymeric materials: Types of polymers, Mechanism of polymerization, Mechanical behaviour of polymers, Fracture in polymers, Rubber types and applications, Thermosetting and thermoplastics, Conducting polymers
Ceramics: Types, structure, properties and application of ceramic materials
Other materials: Brief description of other materials such as Corrosion resistant materials, Nano phase materials, Shape memory alloy, SMART materials

Text Books:
1. Material Science for Engineers, James F. Shackelford & Madanapalli K Muralidhara, Pearson Education

Reference Books
1. Materials Science by M.S. Vijaya , G.Rangarajan, Tata MacGraw Hill
2. Materials Science by V. Rajendra, A. Marikani, Tata MacGraw Hill
3. Materials Science for Electrical and Electronic Engineers, I.P.Jones, Oxford University Press
4. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
Module –I

Bench Work & Fitting

Plumbing, Threading & Joints:

Pattern making and Foundry
Pattern materials & types of Patterns, patterns making tools, allowances, Construction of patterns, Core prints, Core boxes, colour coding, foundry details i.e. moulding sand, tools etc. Casting process details including different types of Casting

Sheet metal work:
Metals used in sheet metal work, Sheet metal hand tools, Sheet metal operation, Sheet metal joints, Hems and seams, sheet metals allowance, sheet metal working machine, laying out a pattern.

Wood & wood working: structure, grain & seasoning of wood, Carpentry tools, carpentry process, wood working machines.

Module-II

Welding and Related process:
Gas welding, Arc welding, Resistance welding, solid state welding, Newer method, brazing, soldering, bronze welding, welded joints and edge preparation, welding of pipes, inspection and testing of welds.

Mechanical working of metals:
Hot working, Hot Rolling, seamless tubing, Drawing Deep Drawing, Cold drawing, Cold rolling, Peening, sizing, Coining and hobbing.

Smithing & Forging:

Metal Cutting & Cutting tools:
Types of cutting tool, Orthogonal and oblique cutting, mechanics of cutting & Chip formation, Cutting tool nomenclature, Cutting speed and feeds, Cutting tool material and cutting fluids.
The Lathe:
Function of lathe, Types, Size, Descriptions and functions of lathe parts, thread cutting mechanism, Centering, Turning, Taper Turning, Knurling, Filing, Polishing, Grooving, Drilling, Reaming on Lathe, Cutting tools, Tools bits & tool holders, types of tool, cutting speed, depth of cut.

3hrs
Capstan & Turret Lathes:
Difference between a Capstan, and turret and engine lathe, Principal parts of Capstan & Turret lathe, Tools & Tool holding devices, Production of a hexagonal bolt etc.

Module –III

Boring Machine
Types and parts of boring machine, Size, Boring tools, Horizontal & Vertical boring, operations, Jig boring machine details.

2hrs

Drilling machine
Types portable drilling machine, Sensitive, Upright, Radial, Gang, Multiple spindle, and Autonate drilling machine quantities, deep hole, machines, parts, Tool holding devices, Drill size, cutting speed, feed etc.

2hrs

Shaper:
Types, Principal parts, Size of shaper, shaper mechanism, operation, tools, cutting speed/feed, depth of cut etc.

2hrs

Planning machine & slotting machine:
Types, sizes, parts, Mechanism of operation, Tools, Cutting speed, Feed and depth of cut.

2hrs
Grinding machine:
Kinds of grinding, different parts grinding operation wet and dry grinding, Grinding wheel (shapes & sizes) selection of grinding wheel, cutting speed & work speed. Feed & depth of cut.

3hrs
Milling Machine:
Types, Parts, mechanisms, size, cutters, fundamentals of milling processes, Gear cutting, fundamentals of gear milling, spur and helical gear, gear hobbing and Bevel gear generating process.

4hrs
Powder metallurgy:
Introduction, Process, manufacture of metal powder, Blending, Compacting, Presintering, sintering, Isostatic pressing, Products of powder metallurgy, Advantages & disadvantages.

3hrs

Text Book:
3. chapman W.A>J. Workshop Technology Vol-I,II,III
Module –I

**Ships Terms:**
Various terms used in ship construction with reference to ship’s parameter e.g. L.B.P., Moulded draught etc., General Classification of Ships.

**Stresses in ship’s Structure:**
Bending, Shear, Hoggling, Sagging, Racking, Pounding, Panting etc., and Strength members to counteract the same.

Module- II

**Sections and materials use:**
Type of section like Angles, Bulb Plates, Flanged beams used in ship construction, Rivetting & Welding. Testing of welds, fabricated components.

**Bottom & Side Framing:**
Double bottoms, Water tight floors, solid and bracket floors, Longitudinal framing, keels, side framing like Tankside brackets, Beam Knee, Web frame etc.

Module- III

**Shell & Decks:**
Plating systems for shells, Deck plating & Deck girders, discontinuities like hatches and other openings, supporting and closing arrangements, mid-ship Section of ships.
Module – I
Ship Geometry and hydrostatic calculations – ship geometry, body plan, half-breadth plan, profile and buttocks; offset table; Numerical integration methods – Trapezoidal rule, Simpson’s rules, three-eight-minus-one rule, Tchebycheff’s rule and other methods; Sectional area and vertical moment calculation; hydrostatic calculations and curves.
Weights – total weight of ship as a sum of light weight and deadweight; light weight – steel, machinery and outfit; deadweight – cargo, ballast and consumables; inclining experiment; LCG and VCG estimation.
Capacities – volumetric capacity of cargo spaces, tanks and other spaces; capacity table and diagram; GRT and NRT computation.
(15 hours)
Module – II
Transverse stability at small angles – Definition of stable, unstable and neutral equilibrium; stability at small angles – metacentric radius and metacentric height; effect of free surface, lifting of weight, grounding etc., stability of submerged bodies, stability of catamarans.
Transverse stability at large angles – cross curves of stability; stability lever/stability moment curve; inclining moment, dynamical stability; angle of loll, angle of vanishing stability; IMO regulations on stability.
(10 hours)
Longitudinal stability and trim – Longitudinal BM, MCT1, change of L.C.B with change of trim, change of trim due to adding or deducting weights, change in draft and trim because of filling / flooding several tanks with different densities, alteration of draft due to change in density, Flooding calculations, Floodable length curves, M.O.T method for determination of floodable lengths, factors of subdivision, Loss of stability due to grounding, Docking stability, Pressure on chocks.
Module – III
Strength of Ships : Curves of buoyancy and weight, Curves of Load, Shearing force and bending moments, Alternate methods, Standard conditions, Balancing ship on wave, Approximation for max. Shearing force and bending moment, method of estimating B.M & Deflection. Longitudinal strength, Moment of Inertia of Section, Section Modulus.
(10 hours)
Freeboard – freeboard and reserve buoyancy; damage stability – introduction; ILLC guidelines for freeboard – Class A and class B freeboards; Water-tight Closing appliances on deck; Plimsol mark and assignment of freeboard; draught marks forward and aft.
Vibration – Calculation of hull natural frequency at different modes, propeller RPM and hull resonance diagram
PCME 7202 Mechanical Engg. Lab

Group A
1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Inertia of Flywheel

Group B
4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli’s Theorem and its application to Venturimeter.

Group C
7. Calibration of Bourdon Tube Pressure gauge and measurement of pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.

PCME 7201 Machine Drawing

Machine drawing related to ship components / parts
HSSM7203 **Communication & Interpersonal skills for Corporate Readiness Lab.**

**Lab** 30 hours

This course will focus on communication in professional (work-related) situations of the kind that BPUT graduates may expect to encounter on entering the professional domain.

Some typical forms of work-related communication, oral or written, are listed below. Practice activities for all four skills can be designed around these or similar situations.

1. **Gaining entry into an organization**
   i. Preparing job-applications and CVs
   ii. Facing an interview
   iii. Participating in group discussion (as part of the recruitment process)

2. **In-house communication**
   a. **Superior/ Senior ➔ subordinate / junior (individual ➔ individual / group)**
      i. Welcoming new entrants to the organization, introducing the workplace culture etc.
      ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
      iii. Motivating subordinates / juniors (‘pep talk’)
      iv. Instructing/ directing subordinates/ juniors
      v. Expressing / recording appreciation, praising / rewarding a subordinate or junior
      v. Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.
   b. **Subordinate / Junior ➔ Superior / Senior**
      i. Responding to the above
      ii. Reporting problems / difficulties / deficiencies
      iii. Offering suggestions
Module-I  
(20 hours)

**Numerical methods:**
Approximation and round of errors, Truncation error and Taylor’s series
Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller’s method
Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method
Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.
Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature
Ordinary differential equation: Euler’s method, Improvement of Euler’s method, Runge-Kutta methods

Module-II  
(10 Hours)

**Probability:**
Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson and Hypergeometric distributions, Normal distribution, Distribution of several random variables.

Module-III  
(10 Hours)

**Mathematical Statistics:**
Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Chi square test for goodness of fit, Regression Analysis, Fitting Straight Lines, Correlation analysis.

**Text books:**
   Reading Chapters: 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)

   Reading Chapters: 22, 23( except 23.5 and 23.8)

**Reference books:**
BEEE2215 Energy Conversion Techniques

MODULE- I
(10 Hrs)

1. **DC GENERATORS**: Constructional features and operating principles, EMF equation, No Load Characteristics for Separately Excited DC Generator and DC Shunt Generator, Conditions for Self Excitation, Critical Resistance and Critical Speed, Losses and Efficiency.

2. **DC MOTORS**: Speed~Armature Current, Torque~Armature Current and Speed~Torque Characteristic for (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, Starting, Speed control and application of DC motor.

MODULE- II
(10 Hrs)

3. **SINGLE PHASE TRANSFORMERS**: Constructional Features, EMF Equation, Turns Ratio, Open Circuit Test and Short Circuit Test, Losses and Efficiency, Introduction to Three Phase Transformers: Three Single Phase Transformers Connected as a Bank of Three Phase Transformer.

4. **INDUCTION MOTORS**: (a) Three Phase Induction Motors: Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, Concept of Slip, Slip~Torque Characteristics, Starting of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Speed Control of Induction Motors.

   (b) Introduction to Single Phase Induction Motors: Construction, Principle of Operation and Application.

MODULE- III
(10 Hrs)

5. **THREE PHASE SYNCHRONOUS GENERATORS**: Constructional Features, Principle of operation as Alternator, Synchronous reactance, Equivalent circuit of alternator, Power-Angle curve, Synchronization of alternators.


Text Book:

Reference Book(s):
2. The Performance and Design of DC Machines – A E Clayton.
3. Theory and Performance of AC Machines – M G Say
8. Electric Machines – Charles Hubert – Pearson Education.
PCME 4206 Mechanics of Materials-I

Module-I
1. Analysis of Axially Loaded Members:
   Composite bars in tension and compression- temperature stresses in composite rods- statically indeterminate problem.
2. Members in Biaxial State of stress:
   Stresses in thin cylinders, thin spherical shells under internal pressure- wire winding of thin cylinders.
3. Strain Deformation:
   Two dimensional state of strain, Principal strains and principal axes of strain measurements, calculation of principles stresses from strains.

Module-II
4. Shear Force and Bending Moment Diagrams for simple Beams:
   Support reactions for statically determinate beams, relationship between bending moment and sheer force, Sheer force and Bending moment diagrams.

5. Simple Bending of Beams:
   Theory of simple bending of initially straight beams, distribution of normal and sheer stress, beams of two materials composite beams.

Module-III
6. Deflection of beams:
   Slope and deflection of beams by integration method and area- moment method.

7. Torsion in solid and hollow circular shafts
   Twisting moment, strength of solid and hollow circular shafts. Strength of shafts in combined bending and twisting

TEXT BOOKS:
1. Elements of strength of Materials by Timoshenko & Young (Fifth Edition)
   (Chapter : 1,2,3,4,5,6,7,8, ( Relevant article only)

REFERENCE BOOKS:
2. Strength of Materials by G.H. Ryder
**Module-I**

**Engine Room Layout:** Lay out of main and auxiliary machinery in engine rooms in different ships. Layout of Pipe lines, Pipe material, Piping arrangement for steam, bilge, ballast and oil and cooling system lines with various fittings. Domestic fresh water and sea water and sea water hydrosphere system. Colour code and safety fittings of bunkering procedure and in the pipe lines etc.

**Bunkering Procedure:**
Precautions taken i.e. safe practice, safety fittings in bunkering lines etc. Line diagram for H.F.O & D.O in bunkers.

**Blowers and Compressors:**
Operational and constructional details of blowers and compressors used on board ships. Uses of compressed air.

**Pumps & Filters:**
Types of pumps, centrifugal pumps and priming methods, Positive displacement pumps- Reciprocating, Screw, Gear and Lobe pumps, submerged and deep well pumps, characteristics and application of pumps, cane and Maintenance of pumps.
Strainers and filters, types of Marine filters, Auto cleaner and Duplex filters, Static filters, Priming, maintenance of filters.

**Module –II**

**Deck Machinery:**
Various types of deck machinery used in ships (e.g. Winches and Windlass) and their requirements. Operation and Maintenance. Deck Cranes, Hydraulic deck machinery, hydraulic motors, line lifters and systems.

**Anchoring & Mooring:**
Anchors, Anchor windlass, hawse pipe, anchoring arrangement, mooring fitting, mooring & towing winches, mooring arrangement in forwarded and aft.

**Dry cargo Handling**
Cargo winches, light and heavy derrick System, Cranes, types of cargo hatch covers and their operation, Automatic loading and unloading of bulk cargo, RORO Ships, stem and side doors for horizontal loading of cargo and vehicles.

**Lifting Gears:**
Engine room crane, chain blocks, tackles, Anchor chain its testing & survey requirement.

**Module-III**

**Heat Exchangers:**
Tubular and plate type, construction and maintenance, materials used, Tube removal & plugging.

**Pollution Prevention:**
Use of coalescers, baffles, grids, Stoke's law, Static & Turbo Separators, Oily Bilge Separators, their construction and operation, prevention of oil pollution and various international requirements, Marpol Conventions, OLM & OCM, introduction of IMO conventions, regulation, rules and arrangements. Job requirements of a watch keeping engineer.

Regulations regarding Sewage, Garbage and liquid discharge from ships, Sewage Treatment plant, Sludge Tank & Sludge P/P, Incinerator.

**Ventilation:**
Ventilation of Cargo holds, pump rooms, CO₂ and Battery Room, Air Charge requirements, Total air requirement of engine room for efficient combustion, compressed air system in Engine Room, Regularity requirement for Ventilation, ventilator openings on deck, fans, their installation and maintenance.
Module –I
1. Mechanisms: Basic Kinematic concepts and definitions, Mechanism, Link, Kinematics Pair, Classification of Kinematic pairs, Degrees of freedom, Kinematic, Binary Rernay and Quaternary joints and links, degrees of freedom for plane mechanism, Grubler’s Equation, Inversion of mechanism, Four bar chains and their inversion, single slider crank chain, Double slider crank chain and their inversion
3. inertia forces in reciprocating Parts: Velocity and acceleration of piston by analytical method, Angular velocity and angular acceleration of connecting rod analytical method and by graphical method, piston effort, force acting along the connecting rod, Crank Effort, Turning moment on crank –Shaft.

MODULE-II
4. Dynamically equivalent system, compound Pendulum, correction couple. Turning moment diagram for different types of engines, Fluctuation of energy and fluctuation of speed.
5. Friction of a screw and nut, Square threaded Screw, V-threaded screw, pivot and collar friction, friction circle, Friction axis, Friction clutches, Transmission of power by single plate, multi plates and cone clutches.

MODULE-III
8. belt, rope and chain drives, Initial tension, Effect of centrifugal tension on power transmission, Maximum power transmission capacity, Belt creep and slip.

Text Books
   Chapter : 1, 3, 4,7,8,10,11,12.
2. Reference Books:
   1. The Theory of Machines – Thomas Bevan.
PCMR 4205 Ship Construction

Module – I
Statutory Certificates:
Statutory certificates and their validity. Ships registration formalities, intact stability, criteria under damaged conditions (constructional point of view in compliance with statutory regulations, Enhanced survey requirements, HSSC).
Constructional Features and rule guidelines for a merchant vessel as per MARPOL regulations, IBC and IGC codes.

(15 hrs)
Materials for shipbuilding – steel, physical properties, Grades of steel for shipbuilding; aluminum, shipbuilding grade, where used; Fibre Reinforced plastics, types of fibres and resins, moulding methods, precautions during construction; Testing of materials and welds, destructive and non-destructive testing methods, rule requirements for testing.

(12 hrs)
Module – II
Shipyard layout – design office, mould loft, stockyard, plate preparation, hull shop, prefabrication shop, building berth, assembly shops and area, outfitting jetty, building docks; material handling; painting.

(4 hrs)
Shipbuilding Practice – preparation, marking, cutting, forming and welding of plates and section; subassembly and assembly of units; unit construction method; outfitting and advanced outfitting; dock trials and sea trials, delivery.

(10 hrs)
Launching – end-on launching, side launching – launching ways, launching schedule.

(3 hrs)
Module – III
Building docks and dry docks – docking and floatation of ships in a dry dock; fitting and removal of propellers and rudders; under water hull inspection and repairs.

(9 hrs)
Quality control – Role of Classification Societies; Construction under survey and periodic surveys; Classification Society Rules; Shipyards own quality control.

(7 hrs)
**PCMR 7206 Marine Engineering Drawing**

**Module I**
Drawing: Advanced Marine Machinery assembly drawings.
Part - I (Auxiliary Machine)
Marine machinery components as assorted stop and sluice valves and auxiliary equipment dismantled; to be conceptualised in assembly and laid out as working & functional parts. Sectional views in elevation and plans executed. Part sectional views depiction.
Part - II (Main Machine)
Marine engine components dismantled. Assembled drawings of pistons, thrust blocks, liners, connecting rods, crossheads, injection valves, starting valves, Fuel pumps, stern tube & Tail shaft, Rudder carrier bearing and all equipment with main machinery. Sectional / Outside and plan views of parts fitted / removed and in functional order.

1. **Architectural Design-I & Measured Drawing**

**Objective:** to develop the skill of analysis, creative idea finding & their synthesis. Design of simple space through creative ideas by visualizing external & internal dimensions.
Design of small objects with respect to function, structure and aesthetics.
Importance of physical factors in architectural design, orientation, ventilation, adequate protection from rain, insects etc.
The human dimensions in various postures. Their relation to dimensioning of everyday utilities like the table, chair, sinks etc.
Design of small structures- street furniture, kiosks, clock towers, milk booth, cycle stand, shop etc. and objects of interest with respect to form and orientation.
Study of design of part of residential buildings, with respect to Indoor and outdoor spaces of buildings. Detail layout of residential components such as bathrooms, kitchen, bed room etc.
Minimum two projects and one time problems must be conducted.
Time problem is to be of 8 hours duration.

**PCME 7204 Material Testing and Heat Power Lab**

( Any Eight )

**Material Testing**
1. Impact strength
2. Hardness strength
3. Rigidty modulus
4. Compression / Bending strength
5. Fatigue strength

**Thermodynamics**
6. Testing of Diesel Engine (single cylinder)
7. Testing of Petrol Engine (single cylinder)
8. Study of cut model of water tubes and fire tube boilers
9. Determination of effy of compressor
10. Valve timing diagram of IC engines

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