BASIC REFRIGERATION

CODE MR 201

L   T   P
2   --   2

RATIONALE

This subject provides the basic idea of Refrigeration to the technician of Refrigeration and Air Conditioning. Basic knowledge acquired by a technician in this subject will help him to learn advance subjects of Refrigeration.

The contents of the subject are such that the technicians are able to understand the basic concept and will be able to solve problems on Refrigeration.

CONTENTS

1.   Introduction to Refrigeration :

    1.1   Brief history of refrigeration
    1.2   Definition
    1.3   Methods of producing cold
    1.4   Heat engine, heat pump and refrigerating machine
    1.5   Coefficient of performance, unit of refrigeration
    1.6   Reversed Carnot cycle
    1.7   Classification of refrigeration systems.

2.   Air Refrigeration Cycle :

    2.1   Reversed Brayton cycle
    2.2   Analysis of gas cycle
    2.3   Actual gas cycle
    2.4   Application to aircraft refrigeration
    2.5   Air cycle systems for aircraft

        2.5.1   Simple system
        2.5.2   Bootstrap system
        2.5.3   Regenerative system
        2.5.4   Reduced ambient system

    2.6   Simple numerical problems

3.   Simple Vapour Compression System :

    3.1   Vapour compression cycle
    3.2   Pressure-enthalpy and temp.-entropy diagrams and calculations
    3.3   Dry and wet compression
    3.4   Effect of evaporator and condenser pressure
    3.5   Effect of suction superheat and liquid subcooling
    3.6   Effect of pressure losses
    3.7   Actual vapour compression cycle
    3.8   Simple numerical problems

4.   Compound Vapour Compression System :

    4.1   Multistage compression system
    4.2   Flash gas removal, flash gas intercooling
    4.3   Multi evaporator system
    4.4   Cascade system
    4.5   Manufacture of solid carbon dioxide

5.   Refrigerants :

    5.1   Survey of refrigerants
    5.2   Designation

5.3   Selection of refrigerants
5.4   Desirable properties
5.5   Primary and secondary refrigerants
5.6   Properties of some commonly used refrigerants
5.7   Azeotropes
5.8   Ozone safe refrigerants

6.   Vapour Absorption Systems :

6.1   Simple vapour absorption system
6.2   Modification to simple system
6.3   Desirable properties of refrigerant absorbent
6.4   Lithium bromide water system

7.   Ejector Compression System :

7.1   Steam ejector system
7.2   Thermodynamic cycle
7.3   Theoretical analysis of steam ejector

8.   Miscellaneous Refrigeration Systems:

8.1   Thermoelectric refrigeration
8.2   Magnetic refrigeration
8.3   Vortex tube
8.4   Solar refrigeration

PRACTICALS

1.   To study the safety rules and introduction of tools used in refrigeration and air conditioning.
2.   Study of following units with special reference to refrigeration system circuit

2.1   Domestic refrigerator
2.2   Water cooler
2.3   Electrolux refrigerator

3.   Practice of cutting, flaring and bending copper tubes.
4.   Practice of swaging and brazing of copper tubes.
5.   To determine refrigerant from operating characteristics
6.   To observe pressures and temperatures on operating units and draw pressure - enthalpy diagram.
7.   To find out power consumption of domestic refrigerator and water coolers of different capacities
8.   Study of thermoelectric refrigeration system.
9.   Study of solar refrigeration system.

REFERENCE BOOKS :

1. A Course in Refrigeration & Air Conditioning   Domkundwar & Arora
2. Refrigeration & Air Conditioning   C.P. Arora
3. Refrigeration & Air Conditioning (Hindi)   N.K. Mangal
4. Refrigeration & Air Conditioning   Ballaney

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BASIC AIR CONDITIONING

CODE MR 202   L   T   P
                                                                                   2   -- 2

RATIONALE

Basic idea of Air Conditioning to the technician of Refrigeration and Air Conditioning. Basic knowledge acquired by a technician in this subject will help in this subject to learn advance subjects of Air Conditioning.

The contents of the subject are such that the technicians are able to understand the basic concept and will be able to solve problems on Air Conditioning.

CONTENTS

1. Introduction to Air Conditioning :

1.1   Concept of air conditioning
1.2   Physiological basis
1.3   Air conditioning systems

      1.3.1   Classification
      1.3.2   Components

2. Human Comfort :

2.1   Factors influencing comfort
2.2   Air temperature and human health
2.3   Physical impurities of air
2.4   Physiological principles

      2.4.1   Body temperature regulation
      2.4.2   Thermal interaction with environment

2.5   Concept of effective temperature
2.6   Factors influencing effective temperature
2.7   Comfort chart
2.8   Comfort zone
2.9   Limitations of comfort chart

3. Psychrometry :

3.1   Introduction
3.2   Psychrometric properties
3.3   Psychrometric relations
3.4   Psychrometric chart
3.5   Psychrometric processes

      3.5.1   Sensible heating and cooling
      3.5.2   Humidification and dehumidification
      3.5.3   Mixing of air streams

3.6   Apparatus dew point
3.7   Sensible heat factor and bypass factor

4. Air Conditioning Systems :

4.1   Classification
      4.1.1   Unitary system
      4.1.2   Package system
      4.1.3   Split system
      4.1.4   Central station system

4.2 Factors affecting design and installation
4.3 Unitary system for multiroom buildings

    4.3.1 Fan coil unit system
    4.3.2 Duct type unit system
    4.3.3 High velocity conduit system

5. Heat Pump :

5.1 Basic principles
5.2 Types of heat pumps

    5.2.1 Air to air system
    5.2.2 Air to water system
    5.2.3 Water to water system

5.3 Limits of heating capacity
5.4 Heat pump economics

6. Air Conditioning System Components:

6.1 Chilled water and direct expansion coil
6.2 Dehumidification by sorbent materials

    6.2.1 Sorbents, absorbents, adsorbents

6.3 Liquid absorption system
6.4 Solid absorption system
6.5 Humidifiers

    6.5.1 Residential humidifiers
    6.5.2 Industrial humidifiers

6.6 Air washers

    6.6.1 Spray type
    6.6.2 Cell type

7. Evaporative cooling system :

7.1 Introduction
7.2 Basic psychrometric of evaporative cooling
7.3 Saturation efficiency
7.4 Limitations of evaporative cooling
7.5 Removing heat by evaporative cooling
7.6 Types of evaporative coolers

    7.6.1 Spray type
    7.6.2 Rotary type
    7.6.3 Wetted pad type

PRACTICALS

1. To find out various psychrometric properties with a sling psychrometer
2. Study of air conditioning tutor.
3. Study and perform mixing process of air streams on the tutor.
4. Study and perform sensible heating and cooling process on the tutor.
5. Study and perform humidification and dehumidification process on the tutor.
6. Study of window air conditioner with reference to refrigeration system circuit and identification of components.

7.   Study of split type air conditioner.
8.   Study of heat pump system.
9.   Determination of effectiveness of an Cellulose pad type air washer
10. Determination of C.O.P. and capacity of an air conditioner.
11. Determination of effectiveness of a desert cooler.
12. Determination of cooling effect of an air conditioner and humidity measurement.

REFERENCE BOOKS :

1. Refrigeration and Air Conditioning   C.P.Arora
2. Modern Air Conditioning Practice   Norman C.Harris
3. A Course in Refrigeration & Air Conditioning   Domkundwar & Arora
4. Air Conditioning & Refrigeration   Severns & Fellows

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HEAT TRANSFER

CODE MR 203   L   T   P
                                                                        2   2/2 --

RATIONALE

The technician in the field of Refrigeration and Air conditioning have to deal with various heat losses and heat gains from the refrigerated and air conditioned space where knowledge of heat transfer is very essential. The contents of the subjects are such that the technicians will be able to understand the basic concepts of various heat transfer processes and will be able to solve the problems of heat load calculations.

CONTENTS

1.   Introduction :

   1.1   Importance of heat transfer
   1.2   Modes of heat transfer and their basic concepts

       1.2.1   Conduction
       1.2.2   Convection
       1.2.3   Radiation

2.   Conduction :

   2.1   Study state unidirectional heat conduction
         without heat generation
   2.2   Fourier's equation

       2.21   Derivation in cylindrical coordinates

   2.3   Heat flow through

       2.3.1   Plane wall
       2.3.2   Composite wall
       2.3.3   Cylinder of uniform conductivity

   2.4   Thermal resistance and conductance
   2.5   Electrical analogy
   2.6   Logmean area
   2.7   Lagging of pipes
   2.8   Critical thickness of lagging
   2.9   Simple numerical problems

3.   Convection :

    3.1   Basic theory
    3.2   Film coefficient
    3.3   Free convection
    3.4   Forced convection
    3.5   Hydrodynamic and thermal boundary layers
    3.6   Buckingham theorem
    3.7   Commonly used dimensionless numbers and their relationship

4.   Radiation :

    4.1   Basic theory
    4.2   Plank's law
    4.3   Stefan Boltzman equation
    4.4   monochromatic and total emissive power
    4.5   Absorption, reflection and transmission
    4.6   Significance of black, white, grey and real surfaces
    4.7   Kirchoff's law
    4.8   Wien's displacement law(no proof)
    4.9   Concept of shape factor

5.   Heat Exchangers :

    5.1   Classification
             5.1.1   Parallel flow
             5.1.2   Counter flow
             5.1.3   Cross flow
             5.1.4   Baffle arrangement

    5.2   Evaporators and condensers
    5.3   Overall heat transfer coefficient
    5.4   Local overall heat transfer coefficient
             5.4.1   With fouling factor
             5.4.2   Without fouling factor

    5.5   Logmean temperature difference
    5.6   Effectiveness of heat exchanger
    5.7   Concept of number of transfer units

6.   Fins :

    6.1   Types
    6.2   Steady flow of heat from a long rectangular fin
    6.3   Fin efficiency
    6.4   Application and uses
    6.5   Description of finned tube heat exchanger

7.   Thermal Insulation :

    7.1   Purpose
    7.2   Types
             7.2.1   Vacuum
             7.2.2   Porous
             7.2.3   Evacuated porous

    7.3   Vapour barriers
    7.4   Common insulating materials and their properties

REFERENCE BOOKS :

1. Heat and Mass Transfer   Domkundwar
2. Heat Transfer   S.P. Sukhatme
3. Heat and Mass Transfer   J.P. Holman
4. Heat Transfer   Gupta & Prakash
5. Heat and Mass Transfer   Y A Cangle

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THERMAL ENGINEERING

CODE MR 204   L   T   P
       MP 204   2   -- 2

RATIONALE

For a technician in Refrigeration and Air Conditioning field the subject of heat engineering is very important for understanding the basic principles and concepts of thermodynamics and its application. Boilers have been added to the contents so as to provide knowledge about the generation of steam for heating purpose. Knowledge of air compressors is also essential for them.

CONTENTS

1.   **Introduction :**

    1.1   Basic concept
    1.2   Types of system
        1.2.1   Open
        1.2.2   Closed

    1.3   Isolated boundary and surroundings
    1.4   Intensive properties
        1.4.1   Pressure
        1.4.2   Temperature

    1.5   Extensive properties
        1.5.1   Mass
        1.5.2   Volume
        1.5.3   Specific heat
        1.5.4   Internal energy
        1.5.5   Potential energy
        1.5.6   Kinetic energy
        1.5.7   Flow energy
        1.5.8   Heat, work
        1.5.9   Enthalpy

2.   **Gas Laws :**

    2.1   Boyle's law
    2.2   Charles's law
    2.3   Joule's law
    2.4   Characterised gas equation
    2.5   Gas constant
    2.6   Mole
    2.7   Universal gas constant
    2.8   Molar specific heat
    2.9   Simple numerical problems

3.   **Laws of Thermodynamics :**

    3.1   Zeroth law
    3.2   First law

3.3   Law of conservation of energy and its mathematical equation
3.4   Second law
3.5   Concept of entropy

4.   Thermodynamic Processes :

4.1   Study and p-v diagrams

    4.1.1   Constant pressure

    4.1.2   Constant temperature
    4.1.3   Hyperbolic
    4.1.4   Reversible adiabatic
    4.1.5   Polytropic
    4.1.6   Free expansion and throttling

4.2   Work done
4.3   Change of internal energy
4.4   Change of entropy
4.5   Simple numerical problems

5.   Cycles and Air Standard Efficiency :

5.1   Concept of reversibility
5.2   Thermal efficiency of cycle
5.3   Air standard efficiency and its assumption
5.4   Carnot cycle

    5.4.1   P-v diagram
    5.4.2   Thermal efficiency
    5.4.3   Application
    5.4.4   Limitation

5.5   Concept of heat engine, refrigerator and heat pump
5.6   Explanation of entropy
5.7   Simple problems on work done and efficiency of Carnot cycle

6.   Properties of Pure Substances (Steam) :
6.1   Change of phase of water during a constant pressure process
6.2   Generation of steam at constant pressure
6.3   Enthalpy of wet and dry saturated steam
6.4   Dryness fraction
6.5   Superheated steam
6.6   Enthalpy of steam
6.7   Specific volume
6.8   External work of evaporation
6.9   Internal latent enthalpy
6.10   Internal energy of steam
6.11   Entropy of steam
6.12   Use of steam tables, T-S, H-S charts
6.13   Heating and expansion of steam during thermodynamic processes
6.14   Change of internal energy, enthalpy and entropy of steam
6.15   Simple problems

7.   Steam Boilers :

7.1   Classification
7.2   Description and working
7.3   Boiler mountings and accessories

8   I. C. Engines :

      8.1   Classification of I.C. Engines
      8.2   Two stroke and four stroke cycles
      8.3   Brief description and working of Petrol Engine and
                 Diesel Engine.
      8.4   Cooling of I.C. Engines
      8.5   Lubrication systems of I.C. Engines
      8.6   Governing of I.C. Engines
      8.7   Description of Zenith and MPFI carburetor
      8.8   Diesel fuel pump and injector
      8.9   Carnot cycle
      8.10   Otto cycle
      8.11   Diesel cycle and
      8.12   Dual combustion cycle
      8.13   Their air standard efficiency
      8.14   Simple problems
      8.15   I.P., B.P., and methods of finding I.P. and B.P.
      8.16   Mechanical energy balance sheet of I.C. engines.

9.   Air Compressors :

      9.1   Industrial use of compressed air
      9.2   Classification of compressors

           9.2.1   Single stage compressor
           9.2.2   Multistage compressor

      9.3   Intercooling and aftercooling
      9.4   P-v diagrams and power required
      9.5   Rotary and centrifugal compressor

PRACTICALS

1.   Study by models/charts/actual units of Common type of fire tube and water tube boiler
2.   Study by models/charts/actual units of the followings -
      2.1   Boiler mountings
      2.2   Boiler accessories
3.   Study by models, charts and actual units of Petrol Engine
4.   Study by models, charts and actual units of Diesel Engine
5.   Study by models, charts and actual units of Carburetor
6.   Study by models, charts and actual units of Diesel fuel pump and fuel injector
7.   Determination of dryness fraction of steam by separating and throttling calorimeter
8.   Study of reciprocating air compressor.
9   Study of rotary air compressor.
10.   Study of centrifugal air compressor.

REFERENCE BOOKS :
1.   Thermal Engineering   Mathur & Mehta
2.   Thermal Engineering   Rai & Saro
3.   Thermal Engineering   Balani
4.   Thermal Engineering   Verma & Gulecha
5.   Thermal Engineering   Nag
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R.A.C. DRAWING

CODE MR 205   L   T   P
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RATIONALE

Drawing is the language of Engineers. It is the purpose of the course to develop the ability to visualize system components. An attempt has been made to make the technician familiar with symbols and various drafting practice. Wiring diagrams of Air Conditioners, Refrigerators and Water coolers of various popular brands are included so that students are at practical hand at their first training.

CONTENTS

1.   Standard Graphical Symbols :

1.1   Basic symbols employed in Refrigeration and Air Conditioning
1.2   Symbols employed in heating
1.3   Symbols employed in plumbing
1.4   Symbols employed in sprinklers

2.   Drawing of Following R & A/C Components :

2.1   Condensers

        2.1.1   Shell and tube type
        2.1.2   Evaporative type

2.2   Evaporators

        2.2.1   Dry expansion
        2.2.2   Flooded
        2.2.3   Shell and tube type chiller

2.3   Cooling Towers

        2.3.1   Natural draft
        2.3.2   Induced draft
        2.3.3   Forced draft

2.4   Thermoelectric Expansion Valves

        2.4.1   Externally equalised
        2.4.2   Internally equalised

2.5   Solenoid Valves
        2.5.1   One way
        2.5.2   Three way

2.6   Reciprocating Compressors

        2.6.1   Open type
        2.6.2   Hermetically sealed type

3.   Free Hand Sketching :

3.1   Internal wiring diagram of relays
        3.1.1   Current type
        3.1.2   Voltage type

3.2   Window A/C circuit diagrams
        3.2.1   CSR Circuit
        3.2.2   PSC Circuit

3.3   Domestic refrigerator circuit diagram
3.4   Water cooler circuit diagram

4.   Drawing of Following Water Piping Valves & Fittings :

4.1   Ball Valve
4.2   Ball Valve with Strainer
4.3   Butterfly Valve
4.4   Non Return Valve
4.5   Two-way Modulating Valve
4.6   Three-way Modulating Valve
4.7   Balancing Valve
4.8   Pot Strainer

REFERENCE BOOKS :

1.   Principles of Refrigeration   Roy J. Dossat
2.   Refrigeration and Air Conditioning   Althouse A.D.

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ELECTRICAL ENGINEERING

CODE MR 206   L   T   P
                                                                    2   --   2

RATIONALE

This subject is designed to give basic knowledge of electrical m/c such as transformer, A.C./D.C. machine.

CONTENTS

1.   D.C. Machines :

1.1   Construction
1.2   Operation of D.C. generator
1.3   Operation of D.C. motor
1.4   Types of D.C. generator and motor
1.5   Starters
1.6   Speed control methods
1.7   Characteristics of D.C. motors

2.   Transformer :

2.1   Construction of single phase transformer
2.2   Types of transformer
2.3   Principle of operation
2.4   E.M.F equation
2.5   Testing of T/F

2.5.1   Polarity test
2.5.2   Open circuit test
2.5.3   Short circuit test

2.6   Efficiency and losses
2.7   Voltage regulation
2.8   Single phase auto transformer
2.9   Types of 3 phase transformers
2.10   Cooling methods

3. **Induction Motor :**

    3.1   Construction and working principle of single-phase induction motor
    3.2   Types of single phase induction motors (description only)
    3.3   Production of rotating magnetic field by three phase currents.
    3.4   Construction and working principle of three-phase induction motor
    3.5   Torque equation
    3.6   Torque slip characteristics
    3.7   Starting and speed control of 3-phase induction motor
    3.8   Various types of starters
    3.9   Methods of increasing starting torque
    3.10   Application

4. **Industrial Drives :**

    4.1   Elementary idea for industrial drives
    4.2   Application of industrial drives in following fields -

        4.2.1   Rolling mill
        4.2.2   Textile mills
        4.2.3   Paper mill
        4.2.4   Crane
        4.2.5   Mines
        4.2.6   Lathe machine
        4.2.7   Pumps
        4.2.8   Food processor, refrigerators punches

5. **Electric Heating :**

    5.1   Advantages of electric heating over other types of heating
    5.2   Principle of operation, construction and uses of electrical
             heating in -

        5.2.1   Resistance heating
        5.2.2   Induction heating
        5.2.3   Arc heating

    5.3   Brief idea of high frequency heating, dielectric heating and its application.

6. **Illumination :**

    6.1   Nature of light
    6.2   Standard terms and definitions
    6.3   Laws of illumination
    6.4   Types of lamps

        6.4.1   Tungston
        6.4.2   Halogen
        6.4.3   Sodium
        6.4.4   Neon
        6.4.5   Mercury vapour lamp
        6.4.6   Fluorescent tubes.

7. **Instrumentation and Measurement :**

    7.1   Principle, construction and working of the following measuring instruments -

        7.1.1   Ammeter and voltmeter (moving coil and moving iron type)
        7.1.2   Dynamometer types wattmeter

       7.1.3   Single phase AC energy meter
       7.1.4   Multimeter and megger

  7.2   Transducers
  7.3   Measurements of mechanical quantities like pressure, strain, temperature

8.   Electrical panels and control equipments

  8.1   Introduction of electrical panels
  8.2   Simple constructional detail and circuit diagram
  8.3   Power factor
  8.3   Control Equipment
       8.3.1   HRC Fuses
       8.3.2   MCB, MCCB, ELCB, ACB
       8.3.2   Relay

PRACTICALS

1.   Study of D.C. machines.
2.   Study of D.C. starter
3.   Connecting starting and reversing the direction of D.C. motor
4.   Determination of turn ratio of transformer
5.   Open circuit and short circuit test on a single phase transformer
6.   Determination of efficiency and regulation of a 1-phase transformer by direct loading.
7.   Connecting, starting and reversing the direction of 1-phase induction motor
8.   Starting of 3 phase Induction motor by D.O.L. starter / star- delta starter.
     motor.
9.   Study of various types of transducers.
10.   Study and calibration of different ammeter and voltmeter
11.   Use of megger and multimeter.

REFERENCE BOOKS :

1.   Electrical Engineering (Hindi & English)   K.D. Sharma
2.   Electrical Technology   B.L.Theraja
3.   Utilization of Electrical Power   H.Pratap
4.   Electrical and Electronic Instrumentation
    & Measurement   H.Cotton

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FLUID ENGINEERING

CODE MR 207

    L   T   P
    2   --   2

RATIONALE

     Technicians have to deal with pressure measurement, transportation of fluid and pumps commonly used in the field of Refrigeration and Air Conditioning for that one has to have a basic knowledge of fluid engineering. Major emphasis in this subject is given to the topics related to Refrigeration and Air Conditioning practice.

CONTENTS

1.   Properties of Fluid :

  1.1   Introduction
  1.2   Definition of a fluid
  1.3   Units of measurement
  1.4   Mass, density, specific volume, specific heat
  1.5   Specific gravity, viscosity, vapour pressure
  1.6   Surface tension and capillary

2.   Fluid Pressure and its Measurement :

2.1   Fluid pressure at a point
2.2   Variation of pressure in a fluid
2.3   Pascal's law
2.4   Atmospheric, absolute, gauge and vacuum pressure
2.5   Measurement of pressure

2.5.1   Simple manometer
2.5.2   Differential manometer
2.5.3   Mechanical gauges

3.   Fundamentals of Fluid Flow :

3.1   Introduction
3.2   Velocity of fluid particles
3.3   Types of fluid flow
3.4   Continuity equation

4.   Equation of Motion and Energy Equation :

4.1   Introduction
4.2   Bernoullis equation
4.3   Application of bernoullis equation
4.4   Venturimeter
4.5   Orifice meter
4.6   Rotameter
4.7   Pitot tube
4.8   Free liquid jet

5.   Flow Through Pipes :

5.1   Introduction
5.2   Types of flow
5.3   Laws of fluid friction
5.4   Darcy-weisbach equation
5.5   Energy losses in pipes
5.6   Hydraulic gradient and total energy line
5.7   Flow through pipes
5.8   Pipes in series or compound pipes
5.9   Equivalent pipe
5.10   Pipes in parallel
5.11   Transmission of power through pipes
5.12   Water hammer in pipes

6.   Impulse Momentum Equation and its Application :

6.1   Introduction
6.2   Impulse momentum equation
6.3   Applications of a impulse momentum equation
6.4   Force on a pipe bend
6.5   Force exerted by fluid jet on stationary flat plate
6.6   Force exerted by fluid jet on stationary curved vane
6.7   Force exerted by fluid jet on moving curved vane

7.   Centrifugal Pump :

7.1   Introduction
7.2   Component parts

7.3   Working
7.4   Work done by the impeller
7.5   Need of a pump
7.6   Losses and efficiencies
7.7   Minimum starting speed
7.8   Limitation of suction lift
7.9   Net positive suction head
7.10   Cavitation in pump
7.11   Priming devices

8.   **Water Turbines**

8.1   Classification of water turbines
8.2   Construction and working of Pelton wheel,
         Francis and Kaplan turbines
8.3   Power developed and hydraulic efficiency of
          Pelton wheel, Francis and Kaplan turbin
8.4   Function of draft tubes
8.5   Cavitations
8.6   Surge Tanks
8.7   Hydraulic Ram, cran and jack

PRACTICALS

1.   Study of manometers and pressure gauges.
2.   Verification of Bernoullie's theorem
3.   Determination of C_d for venturimeter and orificemeter
4   Determination of C_c , C_v , C_d for small orifice
5.   Determination of coefficient of friction for pipes.
6.   Determination of losses in head due to sudden enlargement, contraction and elbows
7.   Testing of centrifugal pump for discharge and head, and to find power   required and efficiencies.
8.   To draw characteristic curves for centrifugal pump
9.   Study of of Pelton wheel turbines with the help of chart/model
10   Study of Constructional features and working of Kaplan turbines

REFERENCE BOOKS :

1.   Fluid Mechanics & M/Cs   Dr Jagdish Lal
2.   Fluid Mechanics & M/Cs   Dr R.K.Bansal
3.   Fluid Mechanics & M/Cs   Dr R.S. Khurmi

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MAINTENANCE AND SAFETY ENGINEERING

CODE MR 208   L   T   P
                                                                    1   --   2

RATIONALE

Maintenance of plant and machinery is a very important aspect; Production   and   productivity are directly related to   the maintenance. Effective running of plants and machines depends on the Efficiency of maintenance department. It economies is the over all cost of production. Safety in plant operation is also very important because it is the basic requirement for the reduction of overall cost of product.

CONTENTS

1.   **Maintenance :**

1.1   Objectives of Maintenance
1.2   Types of maintenance
         1.2.1   Preventive maintenance
         1.2.2   Predictive maintenance

      1.2.3   Breakdown maintenance
      1.2.4   Condition Based Maintenance (CBM)

  1.3   Total Productive Maintenance (TPM)

2.   Maintenance Management :

  2.1   Organisational setup of maintenance department.
  2.2   Need of maintenance department
  2.3   Functions of maintenance department
  2.4   Maintenance planning and scheduling
  2.5   Repair cycle and complexity
  2.6   Equipment history cards

3.   Maintenance Stages :

  3.1   Maintenance procedure
  3.2   Disassembly of machine tool

      3.2.1   Preparation of disassembly
      3.2.2   Disassembly sequence and rules
      3.2.3   Examples of disassembly
      3.2.4   Designing parts for facilitating assembly and disassembly

  3.3   Washing of parts
  3.4   Fault finding
  3.5   Rectification of faults
  3.6   Assembly of mechanisms and machines

4.   Trouble Shooting and General Maintenance of Various Mechanical Equipment :

  4.1   Pumps
  4.2   Air-Compressors
  4.3   I.C. engines
  4.4   Two wheeler
  4.5   Lathe machine
  4.6   Shaper machine
  4.7   Milling machine

5.   Safety Engineering :

  5.1   Importance of safety
  5.2   Analysis of accidents
  5.3   General safety devices used on machines
  5.4   General safety rules and precautions in material handling and working of machines.
  5.5   Knowledge of first aid, artificial respiration and operation of fire fighting equipments

PRACTICALS

Hands on experience of maintenance of General mechanical equipments depend on availability in colleges.

REFERENCE BOOKS :

1.   Installation, Servicing & Maintenance   S.N. Bhattacharya (S. Chand & Co.)
2.   Industrial Engineering   H.P.Garg (S. Chand & Co.)
3.   Industrial Maintenance Management   S.K. Srivastava (S. Chand & Co.)
4.   Plant Maintenance   V.B.Saxena
5.   Maintenance Engg. & Management   R.C. Mishra & Pathde (Prentice Hall)

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ENTREPRENEURSHIP DEVELOPMENT

CODE MR 209   L   T   P
                                                                                        2   2/2 --

RATIONALE

This subject will introduce the students about how to set up a small-scale industry. The subject includes the procedure for how to select, proceed and start the SSI, which also involves a concrete market survey report and project formulation.

CONTENTS

1.   Entrepreneurship :

      1.1   Role of entrepreneurship and its advantage
      1.2   Classification of industries (based on scale)
      1.3   Classification of industries (based on type)

2.   Industrial Policy :

      2.1   New industrial policy
      2.2   M.R.T.P. act.

3.   Entrepreneurial Development :

      3.1   Product identification/ selection
      3.2   Site selection
      3.3   Plant layout
      3.4   Institutional support needed
      3.5   Pre-market survey

4.   Entrepreneurship Support System :

      4.1   Role of District Industries Centre in setting up industry
      4.2   Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMDC
      4.3   Role of state finance corporation, state electricity board, pollution control board, RAJCON, BIS, I.S.O. etc.

5.   Setting up SSI :

      5.1   Registration of SSI
      5.2   Allotment of land by RIICO
      5.3   Preparation of project report
      5.4   Structure of organisation
      5.5   Building construction
      5.6   Establishment of machines

6.   Raw Material Management :

      6.1   Allotment of iron and steel, coke/ coal
      6.2   Allotment of other indigenous raw material from NSIC
      6.3   Allotment of imported raw material and parts

7.   Marketing Facilities :

      7.1   Supply of product to state govt, to defence, to railways, to CSPO, to CSD
      7.2   Participation in international exhibition and fairs, trade centres, state emporium and departmental stores
      7.3   Quality consciousness and its effect on product sales

8.   Financial Sources for SSI :

      8.1   Various institutions providing loans for industries

8.2   Various types of loans
8.3   Subsidies

9.   Contracts and Tenders :

9.1   Type of contracts
9.2   Necessity of contract and tenders
9.3   Type of tenders
9.4   Tendering procedure

10.   Project Report :
10.1   Procedure of preparing a project report
10.2   Format of project report
10.3   Preparation of project report for some SSI items

11.   ISO : 9000 Series of Quality System :

11.1   Definition of few important terms related to ISO quality system
11.2   Various models for quality assurance in ISO : 9000 series
11.3   Various elements of ISO : 9001 model (20 points)
11.4   Benefits by becoming an ISO : 9000 company
11.5   Introduction to total quality management (TQM)

REFERENCE BOOKS :
1.   Hand Book of Small Scale Industry   P.M. Bhandari
2.   Hand Book on Entrepreneurship Development   O.P. Harkut
3.   Entrepreneurial Development   S.S. Khanka
4.   Statistical Quality Control   Mahohar Mahajan
5.   ISO : 9000 Quality System   S. Dalela

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'C' PROGRAMMING

CODE MR 210   L   T   P
same in all branches except AR/CC/CE/CS/ EE /IT   2   --   2

RATIONALE

'C' is computer programming language and also structured programming language. In 'C' programming language we consider various syntax used in programming. By having good knowledge of 'C', students can write modular application and system programs. 'C' can be used in the engineering applications. By acquiring a sound knowledge of 'C' students will be able to understand the concept of all the application areas. This course is specially designed for engineering students of all diploma streams.

CONTENTS

1.   Introduction :
1.1   Scope of 'C' Language
1.2   Distinction and similarities with other HLLs
1.3   Special features and Application areas

2.   Elements of 'C' :
2.1   Character set
2.2   Key words
2.3   Data types
2.4   Constants and Variables
2.5   Operators: unary, binary, ternary
2.6   Operator precedence

3.   Console Input-Output :
3.1   Types of I-O
3.2   Console I-O

3.3   Unformatted console I-O: getchar(), putchar(), gets(), puts(), getch(), getche()
3.4   Formatted I-O: scanf(), printf()

4.   Control Flow :
4.1   Statements and blocks
4.2   if
4.3   switch
4.4   Loops: for, while, do-while
4.5   goto and labels
4.6   break, continue, exit
4.7   Nesting control statements

5.   Arrays :
5.1   Basic concepts
5.2   Memory representation
5.3   One dimensional array
5.4   Two dimensional array

6.   Functions :
6.1   Basic concepts
6.2   Declaration and prototypes
6.3   Calling
6.4   Arguments
6.5   Scope rules
6.6   Recursion
6.7   Storage classes types
6.8   Library of functions: math, string, system

7.   Pointers :
7.1   Basic concepts
7.2   &, * operator
7.3   Pointer expression: assignment, arithmetic, comparison
7.4   Dynamic memory allocation
7.5   Pointer v/s Arrays

8.   Structure and Enumerated Data Types :
8.1   Basic concepts
8.2   Declaration and memory map
8.3   Elements of structures
8.4   Enumerated data types : typedef, enum
8.5   Union

PRACTICALS

1.   Problems based on arithmetic expression, fixed mode arithmetic.
2.   Problems based on conditional statements and control structures.
3.   Problems based on arrays (1-D, 2-D), functions and pointers.
4.   Problems based on engineering applications.

REFERENCE BOOKS :

1.   'C' Programming   Stephen Kochan
2.   Programming with 'C'   Schaum's Series
3.   'C' Programming   V.Balguru Swami
4.   'C' Programming   Kernighan & Ritchie
5.   Let us 'C'   Yashwant Kanetkar

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