PROCESS CONTROLLER

CODE IE 301

L T P
2 -- 2

RATIONALE

Industrial processes need control devices. Devices used for this purpose are called controller. There are various types of controllers used in industry. This subject deals with some of them so the knowledge to this subject is very essential to an instrumentation technician.

CONTENTS

1. **Introduction to Automatic Control:**

    1.1   Concept of open and close loop system
    1.2   Automatic control system
    1.3   Transfer function
    1.4   Concept of feedback and its effects

2. **Control Actions:**

    2.1   On- off control action
    2.2   Proportional control action
    2.3   Derivative control action
    2.4   Integral control action
    2.5   P+D control action
    2.6   P+I control action
    2.7   P+I+D control action
    2.8   Derivations of above actions

3. **Pneumatic Controllers:**

    3.1   Basic control mechanism of pneumatic controller with flapper -nozzle as control element
    3.2   Proportional controller
    3.3   PI controller
    3.4   PD controller
    3.5   PID controller

4. **Hydraulic Controllers:**

    4.1   Principal of operation of presser control pilot
    4.2   Hydraulic Proportional controller
    4.3   Hydraulic Proportional + Integral Controller
    4.4   Hydraulic Proportional + Derivation Controller
    4.5   Hydraulic Proportional + Integral + Derivation Controller

5. **Electronic Controllers:**

    5.1   Working of OP - AMP as

        5.1.1   Amplifier
        5.1.2   Adder
        5.1.3   Differentiator
        5.1.4   Integrator
        5.1.5   Comparator

    5.2   Electronic On - Off Controller
    5.3   Electronic Proportional Controller
    5.4   Electronic Proportional + Integral Controller
    5.5   Electronic Proportional + Derivative Controller
    5.6   Electronic Proportional + Integral + Derivative Controller

6.   Special Control Schemes:

    6.1   Feed forward control
    6.2   Cascade control
    6.3   Ratio control
    6.4   Split range control
    6.5   Selective control

PRACTICALS

1.   Realization of On - Off Controller and to verify its output
2.   Realization of electronic P Controller and to verify its output
3.   Realization of electronic PI Controller and to verify its output
4.   Realization of electronic PD Controller and to verify its output
5.   Realization of electronic PID Controller and to verify its output
6.   Study of Pneumatic PID Controller
7.   Study of Hydraulic PID Controller
8.   Study of Special control schemes

REFERECNE BOOKS :

1.   Control Engineering   K. Ogata
2.   Control System Engineering   Nagrath & Gopal
3.   Chemical Process Control: An introduction to Theory and Practice ,
        Stephanopoulos, Prentice Hall, New Delhi, 1999.
4.   Process Systems Analysis and Control , Coughanowr, 2nd Edition, McGraw Hill, Singapore, 1991.
5.   Process Control, Peter Harriott , Tata McGraw Hill, New Delhi, 1985.

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OPTICAL INSTRUMENTS & DEVICES

CODE IE 302

L T P
2 -- 2

RATIONALE

To impart latest developments in the Opto electronic devices and fiber optics in the field of measurement and instrumentation technology, this subject is included in the syllabus.

CONTENTS

1.   Fundamentals of Optics
   1.1   Polarization,
   1.2   Diffraction
   1.3   Interference
   1.4   Dispersion
   1.5   Holograms

2.   Optical Sources
   2.1   Light Emitting Diodes (LEDs)
      2.1.1   Structure
      2.1.2   Materials
      2.1.3   Characteristics
   2.2.   Lasers
      2.2.1   Fundamentals of laser emission
      2.2.2   Different types of lasers
         2.2.1   Gas laser
         2.2.2   Liquid lasers
         2.2.3   Semiconductor lasers

3.   Photo Detectors:

   3.1   Photo Voltaic detectors
   3.2   Photo multiplier tube
   3.3   Photo conductive detector
   3.4   PIN diode

4.   Optical fibers:
   4.1   Classification of optical fiber
   4.2   Principle of light transmission through fiber
   4.3   Material consideration
   4.4   Light sources for fiber optics
   4.5   Source coupling
   4.6   Splices and connectors

5.   Use of Lasers:

   5.1   Measurement of distance
   5.2   Measurement of velocity
   5.3   Measurement of acceleration

6.   Optical Instruments :
   6.1   Polarimeter
   6.2   Light intensity meter
   6.3   Spectrum analyzer
   6.4   X-ray fluoroscopic instruments
   6.5   Periscope
   6.6   Optical filters
   6.7   Beam splitters

PRACTICALS

1.   To draw input current versus output intensity curve of LED.
2.   To draw the input/ output characteristics of P V Cell
3.   To draw the input/ output characteristics of Photo diode

4. To draw the input/ output characteristics of Photo transistor
5. To draw the input/ output characteristics of Photo conductive (LDR)
6. Measurement of light intensity by lux meter.
7. Measurement of absorption coefficient of a liquid.
8. Study of Optical filter.
9. Study of Beam splitters
10. Study of Polarimeter

RECOMMENDED BOOKS
1. Optical Fiber Communication   John M Senior, Prentice Hall of India, New Delhi
2. Optical Fiber Communication   J. Gower , Prentice Hall of India, New Delhi
3. Optical Fiber Communication   Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems   JH Franz and VK Jain,
   Narosa Publishing House, New Delhi
5. Optical Fiber Communication Systems   GP Agrawal, John Wiley & Sons, New Delhi
6. Optical Fiber Communication and its Applications   S C Gupta, Prentice Hall of India, New Delhi

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<center>**CONTROL THEORY**</center>

CODE IE 303   **L   T   P**
                                                                                                                2   1   --

<center>**RATIONALE**</center>

This subject is introduced to enable a instrument engineer to design a stable control system and analyse its performance, for this some mathematical tools are required which are introduced in this subject.

<center>**CONTENTS**</center>

1.   Introduction to Process Control:

      1.1   Transfer Function
      1.2   Signal flow graph
      1.3   Mason's gain formula
      1.4   Block diagram representation
      1.5   Mathematical modelling of physical   systems

2.   Time Domain Analysis:

      2.1   Test signals
      2.2   Response of first order system
      2.3   Response of second order systems
      2.4   Rouths stability analysis
      2.5   Steady state error analysis
      2.6   Root locus analysis

3.   Frequency Domain Analysis:

      3.1   Bode plots
      3.2   Polar plots
      3.3   Nyquist stability criterion
      3.4   System stability
      3.5   Relative stability
            3.5.1   Gain margin
            3.5.2   Phase margin

4.   Introduction of Advance Control Techniques:

      4.1   PLC
      4.2   DCS
      4.3   DDC
      4.4   Data loggers
      4.5   SCADA

REFERENCE BOOKS :

1.   Control Engineering   Katsuhiko Ogata
2.   Control System Engineering   Nagrath and Gopal
3.   Automatic Control Systems   Benjamin C. Kuo

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MICROCONTROLLERS

CODE IE 304

L	T	P
2	--	2

RATIONALE

The development of semiconductor technology has revolutionized the branch of electronics, where the complete C.P.U on a single chip which is known as microprocessor has changed the concept of automation as well as has proved itself as a very cost effective and reliable, alternate for automation. In advance technology of electronics field it is necessary to have the knowledge of microprocessors and their application.

CONTENTS

1.   Introduction:

1.1   Historical review of microprocessor development
1.2   Organization of a micro computer

2.   The 8085 Architecture:

2.1   Internal block diagram
2.2   8085 signals and their functions
2.3   Demultiplexing of buses
2.4   Pin configuration and logical diagram.

3.   8085 Instructions and Programming:

3.1   Instruction format

3.1.1   Mnemonics
3.1.2   Opcode and operand
3.1.3   Instruction length

3.2   Classification of instruction

3.2.1   Data transfer
3.2.2   Arithmetic
3.2.3   Logical
3.2.4   Branching
3.2.5   Machine control

3.3   Different interrupts of 8085 Microprocessor
3.4   Addressing modes
3.5   Stack operation and related instructions
3.6   Subroutine and related instructions
3.7   Machine and assembly language
3.8   Assembly language programming
3.9   Debugging of programs

4.   Memory and I/O System:

4.1   Memory types
4.2   Memory organization
4.3   Basic concept of memory interfacing and I/O interfacing
4.4   Difference between peripheral I/O and memory mapped I/O

5.   THE 8051 MICROCONTROLLER:

5.1   Introduction
5.2   The 8051 microcontroller hardware
5.3   I/O pins
5.4   Ports
5.5   External memory
5.6   Counters and Timers

5.7   Serial data
5.8   Interrupts.

6.   8051 ASSEMBLY LANGUAGE PROGRAMMING:

6.1   Addressing modes
6.2   External data moves
6.3   Push and pop opcodes
6.4   Logical operations
6.5   Byte level and bit level logical operations
6.6   Arithmetic operations
6.7   Jump and call instructions
6.8   Interrupts & returns.

PRACTICALS

1.   Study of 8085 microprocessor kit
2.   Addition of two 8 bit numbers with and without carry
3.   Subtraction of two 8 bit numbers with and without borrow
4.   Multiplication of two 8 bit number using successive addition and resistor shifting method
5.   Program to find out square of a number.
6.   Programs involving data arrays

    6.1   Generating odd numbers.
    6.2   Data transfer schemes
    6.3   Sorting of odd/even numbers.
    6.5   Finding largest and smallest numbers.
    6.6   Arrange data array in ascending / descending order

7.   Programs using stack
8.   Programs using subroutine.
9.   Debugging of programs using single stepping on kit
10.   Study of 8051 microcontroller kit

REFERENCE BOOKS :

1.   Microprocessor Architecture, Programming
    & Application   Gaonkar
2.   Fundamentals of Microprocessors   B.Ram
    & MicroComputers
3.   Assembly Language Programming   A.Leventhal, Osborn
4.   Theory & Problems of   Tokhein
    Microprocessor Fundamentals
5.   Microprocessor & Peripheral Hand book   INTEL
6.   Computer Architecture & org.   J.P Hayes
7.   Digital Computer Fundamentals   T.C.Bartee
8.   An Introduction to Microprocessors   A.P.Mathur
9.   Microcontrollers   Shah,Oxford
10.   Principles Of Microcomputers and Microcontroller
    Engineering (International Version),   Cady,Oxford
11.   The 8051 Microcontrollers & Embedded Systems,   Mazidi,Pearson

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POWER AND INDUSTRIAL ELECTRONICS

CODE IE 305
EB305/ EF 305/ EL 305

L T P
2 -- 2

RATIONALE

Industrial plants adopted electronics in terms of timing action, switching action, power control, process control, motor speed control etc called power and industrial electronics. The student should study this subject with a view to understand the use of electronics to bring about faster and more accurate response for industrial plants.

CONTENTS

1. **Introduction:**

   1.1 Principle, Construction and characteristics of SCR, TRIAC, DIAC, UJT, PUT, Power MOSFET, LASCR, solar cell
   1.2 Ratings of SCR
   1.3 "Turn on" and "Turn off" mechanism of SCR
   1.4 Series and parallel connections of SCR
   1.5 Snubber circuits
   1.6 UJT as a relaxation oscillator

2. **Power Control and Rectifiers:**

   2.1 Phase control circuit of SCR

      2.1.1 Simple R-C circuit
      2.1.2 Transformer circuit
      2.1.3 UJT circuit
      2.1.4 Ramp and Pedestal circuit

   2.2 Different methods of turning off SCRs
   2.3 SCR Half Wave rectifier (single phase)

      2.3.1 SCR with resistive load
      2.3.2 SCR with inductive load (with and without free wheeling diode)

   2.4 TRIAC as a power control circuit
   2.5 Three phase HW and FW rectifier using PN junction diode

      2.5.1 Calculation of RMS value
      2.5.2 Average value
      2.5.3 Ripple factor
      2.5.4 PIV
      2.5.5 TUF

3. **Inverters, Choppers and Cyclo-converters:**

   3.1 Basic principle of inverters
   3.2 Series and parallel inverter circuits using SCR (Single phase)
   3.3 Basic idea of PWM inverter
   3.4 Choppers
      3.4.1 Principle of operation
      3.4.2 Chopper control techniques
      3.4.3 Voltage step down chopper
      3.4.4 Voltage step up chopper
   3.5 Cycloconverters
      3.5.1 Principle of operation
      3.5.2 Single phase/single phase cycloconverters (mid point & bridge configuration)

4. **AC Stabilizer and Power Supply :**

   4.1 Resonant stabilizer
   4.2 Electro mechanical stabilizer (using relay and servo motor)

4.3   Electronic stabilizer
4.4   Block diagram of UPS (OFF line and ON line)
4.5   Switched mode power supply (SMPS)

      4.5.1   Block diagram and basic principle
      4.5.2   Types of SMPS
      4.5.3   Merits and demerits of SMPS

5.   A.C., D.C. Motors & control:

5.1   Principle, construction , operation & applications of A.C. & D.C. motors
5.2   Concept of motor speed control (for D.C. motor only)
5.3   Speed torque relation for motor (for D.C. motor only)
5.4   Armature voltage control method (using SCR) (for D.C. motor only)
5.5   Speed control method (using techo-generator) (for D.C. motor only)
5.6   Brief idea of speed control of stepper motor

6.   Heating, Welding and their Application :

6.1   Principle and application of induction heating
6.2   Principle and application of dielectric heating
6.3   Principle of resistance welding
6.4   Type of resistance welding
6.5   Sequential timing circuit

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PRACTICALS

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1.   To plot V-I characteristics of SCR
2.   To plot V-I characteristics of TRIAC
3.   To plot V-I characteristics of UJT
4.   To plot V-I characteristics of DIAC
5.   Observe the various waveforms of UJT relaxation oscillator
6.   Study of half wave rectifier using SCR with resistive load and inductive load.
7.   Application of TRIAC as light dimmer/fan regulator
8.   Study of phase inverter circuit using transistor
9.   Study of inverter circuit using SCR
10.   Study of electronic-mechanical/electronic A.C. stabilizer
11.   Study of UPS
12.   Study of SMPS
13.   Study of speed control of D.C. motor
14.   Study of resistance welding
15.   Assembling and testing of manual stabilizer with auto cut facility.

REFERENCE BOOKS :

1.   An Introduction to Thyristor & their Application   M. Ramamoorthy
2.   Industrial Electronics   G.K. Mithal
3.   Industrial Electronics   O. Cage
4.   Thyristor Engineering   M.S. Berde
5.   Thyristor & its Application   H.C. Rai
6.   Electronics in Industry   Chute & Chute
7.   पॉवर एण्ड इन्डस्ट्रीयल इलेक्ट्रोनिक्स (हिन्दी)   जलान्धरा, माथुर
8.   Industrial Electronics & Control   Biswanth Paul
9.   Power Electronics   P.C. Sen
10. Power Electronics   P.S. Bhimbhara
11. Industrial electronics & control   Biswanath Paul

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BIO- MEDICAL INSTRUMENTATION

CODE IE 306   **L   T   P**
EL 306   2   --   2

RATIONALE

In view of the growing need for medical electronic technician to operate, maintain and service the electronic equipment used in diagnosis & treatment of diseases. Medical science is fully dependent on Electronics Engineering. Almost all-medical equipment's are nowaday electronics based. Therefore the knowledge of this subject will be useful.

CONTENTS

1.   Introduction to Physiology :

    1.1   Physiological systems of the human body
    1.2   Nerve physiology
    1.3   Mechanism of respiration
    1.4   Generation, propagation and distribution of action potentials

2.   Medical Electrodes:

    2.1   Introduction
    2.2   Bio-electrode theory
    2.3   Types of electrodes and implantation
           2.3.1   Microelectrode
           2.3.2   Body surface electrode
           2.3.3   Needle electrode

3.   Bio Medical Recording System:

    3.1   Introduction
    3.2   Construction of centre type PMMC Galvanometer
    3.3   Recording mechanism
    3.4   Writing techniques and recorder problems
    3.5   Constructional features of strip chart recorder
    3.6   Recorder electronics
    3.7   Stylus protection technique
    3.8   X-Y recorder

4.   Electro Cardiograph (E.C.G.) :

    4.1   Electrical activity of heart and its construction
    4.2   Block diagram of E.C.G. machine
    4.3   ECG electrodes
    4.4   Lead configuration
    4.5   ECG electronics
    4.6   ECG controls
    4.7   Heart rate measurement
    4.8   Artefacts and troubleshooting
    4.9   Principle of recording other bioelectric events like EEG and EMG

5.   Pace Makers:

    5.1   Need
    5.2   Classification
    5.3   Block diagram of Demand pacemaker
    5.4   Basic circuit of fixed rate and synchronous pacemaker

6.   Blood Pressure Monitoring:

    6.1   Blood circulation system
    6.2   Blood pressure waveform
    6.3   Blood pressure measurement techniques
           6.3.1   Direct
           6.3.2   Indirect
    6.4   Circuit diagram of B.P. processor to indicate diastolic - systolic blood pressure

7. **Defibrillator:**

    7.1   Need

    7.2   Types of defibrillator

          7.2.1   A.C. defibrillator
          7.2.2   D.C. defibrillator

    7.3   Basic defibrillator circuits and control circuits
    7.4   Lawn waveform and its synchronization
    7.5   Operating controls and precautions

8. **Biomedical Instruments:**

    8.1   Blood Gas analyser
    8.2   Densitometer
    8.3   Flame photometer
    8.4   Blood flow meter
    8.5   Skin and systemic body temperature measurement
    8.6   X- Ray machine

          8.6.1   Tube construction and housing
          8.6.2   High voltage power source
          8.6.3   Block diagram of X-Ray machine
          8.6.4   Image intensifier

    8.7   Concept of Sonography
    8.8   Concept of CT scan
    8.9   Concept of Magnetic Resonance Indication (MRI)
    8.10   Concept of Laproscopic surgery

9. **Bed Patient Monitoring System :**

    9.1   Introduction
    9.2   ICU/ CCU systems

10. **Introduction to Bioinformatics:**
11. **Use of Nanotechnology in biomedical (Brief idea)**

PRACTICALS

1. Study of different types of electrodes
2. Study of different types of recorders
3. Study of ECG machine
4. Measurement of blood pressure using indirect method.
5. Study of blood pressure amplifier
6. Measurement of skin systemic temperature
7. Study of pacemakers
8. Visit to clinical laboratory or hospital
9. Visit to a hospital for X-ray machine / Sonography / CT scan.
10. Visit to ICU/ CCU of hospital

REFERENCE BOOKS :

1. Bio Medical Instrumentation   K.R. Nahar
2. Bio Medical Instrumentation   Chrompbell
3. Electronics for Medical Personnel   Buckstein
4. Servicing Medical &Bioelectronics Equipments   Carl J.J.
5. Medical Electronics   Khandpur
6. Nanotechnology: fundamentals & Applications   Manasi Karkare

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APPLIED INSTRUMENTATION

CODE IE 307   L   T   P
                                                                                                       2   1   --

RATIONALE

A diploma holder in Instrumentation has to apply its knowledge on the various parameter of a process industry. He has to see the stability of the control loop, which has been designed by him. The introduction of this subject in the curriculum is to familiarize the students with the different control loop for different units. Here he will study the process of different Industries, their raw material and final product and different Instrumentation schemes.

CONTENTS

1.   Processes and Control Schemes of the Following in Industries :

    1.1   Iron and steel Industry
    1.2   Glass Industry
    1.3   Power Industry
             1.3.1 Thermal
             1.3.2 Nuclear
             1.3.3 Combined Gas Cycle
    1.4   Cement Industry
    1.5   Fertiliser Industry
    1.6   Paper Industry
    1.7   Sugar Industry

2.   Instrumentation and Control Scheme in Chemical Reactors:

    2.1   Temperature control
    2.2   Pressure control

3.   Instrumentation and Control Scheme In Dryers:

    3.1   Inst and Control in batch dryers
    3.2   Inst and Control in continuous dryers

4.   Instrumentation and Control Scheme of Heat Exchangers:

    4.1   Steam heaters
    4.2   Condensers
    4.3   Reboilers
    4.4   Vaporiser

5.   Instrumentation and Control Scheme in Evaporators:

    5.1   Types of evaporators
    5.2   Measurement and control of pressure
    5.3   Density
    5.4   Conductivity differential pressure.

REFERENCE BOOKS :
1.   Instrumentation in the Processing Industries   Bela G. Liptak Chilton Book Co. 1973
2.   Hand Book of Applied Instrumentation   M. Douglas Considine & S.P. Ross, Mc Graw Hill, 1964.

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SIGNAL CONDITIONING

CODE IE 308

L	T	P
2	--	2

RATIONALE

Various measuring devices are used for measuring different parameters. These devices give signals in various forms. To use them for proper measurement and control we have to condition the signal for appropriate use.

CONTENTS

1.   Introduction :

1.1   Meaning of signal conditioning
1.2   Necessity of signal conditioning
1.3   Analog and Digital signal conditioning

2.   Analog Signal Conditioning:

2.1   Principles of Analog Signal Conditioning

2.1.1   Signal level changes
2.1.2   Linearization
2.1.3   Signal conversion
2.1.4   Filtering and Impedance matching
2.2.   Bridge Circuits
2.3   R.C. Filters
2.4   Instrumentation amplifiers

2.4.1   Basic characteristics
2.4.2   D.C. amplifier
2.4.3.   Op, Amplifier circuits
2.4.4.   Charge amplifier
2.4.5   Isolation amplifier

3.   Digital Signal Conditioning :

3.1   A/D Conversion
3.2   D/A Conversion
3.3   Multiplexer / Demultiplexer
3.4   Encoder / Decoder
3.5   Sample and hold
3.6   Data acquisition system

PRACTICALS

1.   To convert output current of photo cell/ photodiode/ photo multiplier into voltage using operational amplifier current to voltage follower.
2.   To convert voltage to current using operational amplifier voltage to current follower.
3.   To use a logarithmic amplifier and draw characteristics.
4.   To draw the characteristic of a RC low pass filter.
5.   To draw the characteristic of a RC high pass filter
6.   To use a voltage to frequency converter
7.   To use a frequency to voltage converter
8.   To convert an analog signal into digital signal using ADC.
9.   To convert digital signal into analog using DAC.
10.   To use a sample and hold circuit.

REFERENCE BOOKS :
1. Instrumentation Devices & Systems   Rangan, Sharma & Mani
2. Process Control Instrumentation Technology   Curtis Johnson
3. A Course in Electrical, Electronic Measurement
    & Instrumentation   A.K. Swahney
4. Industrial Electronics & Control   Biswanath Paul

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INSTRUMENTATION WORKSHOP

CODE IE 309

L   T   P
1   --   2

RATIONALE

A diploma holder is required to work with his own hands. He has to calibrate different Instruments and maintain all the instruments for measurement and control in the good working condition. One should know the details of maintaining all the instruments.

CONTENTS/PRACTICAL

1. Calibration of Following:

    1.1   Various Temperature Indicators
    1.2.   Pressure Gauge
    1.3   P.D.P.T.
    1.4   Electronic D.P.T.

2.   Connection of a Pneumatic Primary Instrument to a Secondary Instrument with the help of Ferual Fittings.

3.   Making of Simple Contactor Control Circuit Using the Following:

    3.1   Simple relay
    3.2   T.D.R.
    3.3   Sequencing of Motors
    3.4   Inter locking connections for Motors
    3.5   Inter locking connections for various parameters.

4.   Study of Calibration Tools and Instruments:

    4.1   Pneumatic calibrator
    4.2   Electronic calibrator
    4.3   Dead Weight tester
    4.4   Constant temperature bath

5.   Preparation of Following Drawing Sheets:

    5.1   Symbols of electrical components
    5.2   Symbols of electronic components
    5.3   Symbols of pneumatic fittings
    5.4   Symbol of process components
    5.5   Symbol of control components
    5.6   Color coding of pipes and service lines and their identification

6.   Design of Various Control Loops for Different Parameters and their Material and cost estimation:
    6.1   Cascade
    6.2   Feed forward
    6.3   Ratio
    6.4   Three elements

7.   Design of Instruments Air System for four individual users and for Control Room Air Supply using :

    7.1   Air compressor
    7.2   Filter and Regulator
    7.3   Fittings and Piping
    7.4   Pressure gauge

REFERENCE BOOKS:
1.   Applied Instrumentation In Process Industries Vol. I   Andrewes
2.   Practical Process Instrumentation & Control Vol. II   Sh. Jaymal
3.   Hand Book of Industrial Instrumentation   G.C. Carrol

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CODE IE 310   **L   T   P**
Common to all branches except CC/CE/CS/EE/ IT/MA/MR   2   1   --

RATIONALE

To achieve the target and goals in an organisation it is essential to co-ordinate the entire system. For this purpose the knowledge of principles of management, human resources development, material management and financial management is required.

Entrepreneurship 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.   Principles of Management :

1.1   Management, administration and organisation, difference between them.
1.2   Scientific management : Meaning, characteristics, object and advantage : Taylor's scientific management – Fayol's principles of management, functions of management
1.3   Types of ownership, sole trading, partnership, joint stock, co-operative and public enterprise
1.4   Types of organisation, different types and their charts.
1.5   Importance of human relation professional ethics
1.6   Need for leadership, leadership qualities
1.7   Motivation

2.   Human Resources Development :

2.1   Introduction, object and functions of human resource development department
2.2   Recruitment, sources and methods of selection, need for effective training, method of training, duties of supervisor / Formen, Role of HRD in industries.

3.   Wages and Incentives :

3.1   Definition and requirements of a good wage system methods of wage payment
3.2   Wage incentives - type of incentive, difference in wage incentive and bonus. incentive to supervisor.

4.   Material Management :

4.1   Purchasing Functions and duties of purchase department organisation of purchase department, methods of purchasing, purchase order contracts, legality of contracts types of contracts i.e. piece work contract, lumpsum contract, item rate contract, percentage contract, merits and limitation of each contract system, departmental execution of works, rate contract - D.G.S & D and C.S.P.O. tender, necessity, types of tenders, tendering procedure, earnest money and security money
4.2   Store and store keeping : Functions and duties of store department, location and layout of store, bin cards, store ledger, receipt and issue procedure of materials, physical verification of stores, disposal method of unserviceable articles and protection of stores.
4.3   Sales : function and duties of sales department sales promotion advertisement service after sales.

 5.   Financial Management :

5.1   Function and duties of finance department
5.2   Brief idea of journal, ledger, trial balance, trading account, profit and loss account, balance sheet.
5.3   Cheques (crossed and bearer), draft, promissory note, letter of credit, brief idea of cost accounting.
5.4   Numerical problems.

6.   Marketing Management :

6.1   Concept of Marketing
6.2   Problems of Marketing
6.3   Pricing policy
6.4   Distribution channels and methods of marketing

7. **Entrepreneurship** :

   7.1   Entrepreneurship and Entrepreneur
   7.2   Need of Employment and Opportunities.
   7.3   Essential Characteristics of a good Entrepreneur
   7.4   Industrial Policy.
   7.5   Classification of industries- Tiny, small scale , Medium scale, Large scale, Handicraft, Ancillary
   7.6   Type of industries- Production, Job based & Service

8. **Entrepreneurial Development :**

   8.1   Product identification/ selection
   8.2   Site selection
   8.3   Plant layout
   8.4   Institutional support needed
   8.5   Pre-market survey

9. **Entrepreneurship Support System:**

   9.1   Role of District Industries Centre in setting up industry
   9.2   Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMML.
   9.3   Role of state finance corporation, state electricity corporations, pollution control board, BIS, I.S.O. etc.

10. **Setting up SSI :**

   10.1   Registration of SSI
   10.2   Allotment of land by RIICO
   10.3   Preparation of project report
   10.4   Structure of organisation
   10.5   Building construction
   10.6   Establishment of machines

11. **Tax System and Insurance :**

   11.1   Idea of income tax, sales tax, excise duty and custom duty
   11.2   Industrial and fire insurance, procedure for industrial insurance.

12. **Financial Sources for SSI :**

   12.1   Various institutions providing loans for industries
   12.2   Various types of loans
   12.3   Subsidies

13. **Labour Legislation and Pollution Control Acts :**

   13.1   Industrial acts : factory act 1948
   13.2   Workmen's compensation act 1923
   13.3   Apprentices act 1961
   13.4   Water pollution contract act 1974 and 1981
   13.5   Air pollution contract act 1981
   13.6   Environmental protection act 1986
   13.7   Forest (animal conservation act 1972)
   13.8   Pollution control provisions in motor vehicle act.

14. **Project Report :**

   14.1   Procedure of preparing a project report
   14.2   Format of project report
   14.3   Preparation of project report for some SSI items

15.   ISO : 9000 Series of Quality System :

15.1   Definition of few important terms related to ISO quality system
15.2   Various models for quality assurance in ISO : 9000 series
15.3   Various elements of ISO : 9001 model (20 points)
15.4   Benefits by becoming an ISO : 9000 company
15.5   Introduction to total quality management (TQM)

REFERENCE BOOKS :

1.   Industrial Management   V.K. Sharma & O.P. Harkut
2.   Industrial Engg. & Management   O.P. Khanana
3.   Industrial Engg. & Management   T.R. Banga
4.   Hand Book of Small Scale Industry   P.M. Bhandari
5.   Hand Book on Entrepreneurship Development   O.P. Harkut
6.   Entrepreneurial Development   S.S. Khanka
7.   Statistical Quality Control   Mahohar Mahajan
8.   ISO : 9000 Quality System   S. Dalela

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