

### **3.1 FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**L T P**

**4 - 4**

#### **RATIONALE**

The objective of the course is to impart basic knowledge and skills regarding electrical and electronics engineering, which diploma holders will come across in their professional life

#### **DETAILED CONTENTS**

- 1. Overview of Electricity:** (04 Periods)  
General use and applications of electricity; Use and applications of electricity to chemical Engineering, Paint Technology and Rubber Technology Advantages of electrical energy over other forms of energy.
- 2. DC Circuits:** (06 Periods)  
Introduction to basic terms: charge, current, voltage, power, and energy; Ohm's law; Power dissipation in resistors; Series and parallel combination of resistors; Kirchhoff's laws; Star-delta conversions; Ideal and practical voltage source; Current source.
- 3. AC Circuits:** (10 Periods)  
Concept of alternating voltage and current; Introduction to basic terms: cycle, frequency, time period, amplitude, instantaneous value, rms value, peak value, phase difference, form factor, and peak factor; Concept of phasor; Phasor diagrams; Concepts of reactance, impedance, admittance, susceptance, and conductance; Concepts of instantaneous power, real power, reactive power, apparent power, complex power, and power factor; Analysis of simple AC circuits; Overview of three-phase AC circuits.
- 4. Batteries and Solar Cells:** (06 Periods)  
Primary and secondary cells; Construction, working, and applications of Lead-Acid; Charging methods for Lead-Acid batteries; Maintenance of Lead-Acid batteries; Series and parallel connection of batteries; Maintenance free batteries; General idea of solar cells, solar panels and their applications.
- 5. Electrical Machines:** (10 Periods)  
Electromagnetic induction; Introduction to magnetic circuits; Principles of electromechanical energy conversion; Construction and operation of single phase transformers; Tests of transformers; Efficiency and regulation; Operation of autotransformers;. Types of three-phase induction motors; principle of operation;. Methods of starting and speed-control of three-phase induction motors; Overview of single-phase induction motors.; Construction and operation of synchronous machines; Construction and operation of stepper motors. Applications of single and three phase induction motors.

- 6. Semi-Conductor Physics** (04 Periods)  
Conductors, Insulators, Semiconductors, Idea of Energy Level, Energy Band Diagrams of Insulators, Conductors and Semiconductors, Effect of Temperature, Recombination of holes and electrons, n-type semiconductor, p-type semiconductor, Majority and Minority Carriers.
- 7. Semi-Conductor Diode** (06 Periods)  
Mechanism of current conduction and characteristics of ordinary diode, zener diode, LED
- 8. Transistor** (06 Periods)  
Principle of operation characteristics and applications of BJT, JFET, MOSFET, UJT, Concept of configurations.
- 9. Electrical & Electronics Measuring Instruments** (06 Periods)  
Construction and working Principle of PMMC and moving Iron voltmeter and ammeters, single phase dynamometer, wattmeter and induction type energy meter, operation and use of Analog, Digital multimeter, CRO and signal generators.
- 10. Electrical Installation and Safety:** (06 Periods)  
Various accessories and parts of electrical installation; Overview of industrial and domestic wiring systems; Common electrical safety measures; Protection and precaution against electrical shock; Treatment of electrical shock; Basic protective devices like fuse, MCB, thermal overload relay, ELCB, and RCCB; Concepts and types of earthing; Protection against lightning.

### **LIST OF PRACTICALS**

1. Verification of Ohm's Law
2. Verification of KCL and KVL
3. Test of charging and discharging of lead-acid battery using hydrometer
4. Connection of a three-phase motor and starter with fuses and reversing of direction
5. Study of a distribution board for domestic and industrial installation
6. Open-circuit and short-circuit test on a single-phase transformer
7. Star-delta starting of induction motors
8. To draw V-I characteristics of pn-junction diode and LED
9. To draw input and output characteristics of a transistor in CB and CE configurations
10. Use of analog & digital multimeter and measure resistance, voltage & current.
11. Use of CRO & measurement of frequency & voltage.
12. Use of Zener diode as a regulator.

### **RECOMMENDED BOOKS**

1. Principle of Electrical Engineering by V.K. Mehta, S Chand Publication.
2. Basic Electrical Engineering by J.B. Gupta, S.K. Kataria & sons.
3. Basic Electrical Engineering by Sahdev & Sahdev, Uneek Publication.

4. Fundamental of Electronics for polytechnics by Subhadeep Chaudhary, Paragon international Publication
5. Electrical machines by S.K. Bhattacharya Tata McGraw Hill Education Private Limited.

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (Hrs)</b> | <b>Marks Allotted (%)</b> |
|------------------|----------------------------|---------------------------|
| 1                | 04                         | 05                        |
| 2                | 06                         | 10                        |
| 3                | 10                         | 15                        |
| 4                | 06                         | 15                        |
| 5                | 10                         | 05                        |
| 6                | 04                         | 10                        |
| 7                | 06                         | 10                        |
| 8                | 06                         | 10                        |
| 9                | 06                         | 10                        |
| 10               | 06                         | 10                        |
| <b>TOTAL</b>     | <b>64</b>                  | <b>100</b>                |

## 3.2 PROCESS INSTRUMENTATION

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### RATIONALE

The subject will enable the student to gather the knowledge of different instruments used to measure different process parameters. This course will impart knowledge on working principle, construction, repair and use of these instruments.

### DETAILED CONTENTS

- 1.0. Introduction (05 Periods)**
- 1.0. Functional block diagram of instrumentation system.
  - 1.1. Description of each block
  - 1.2. Process
  - 1.3. Process Characteristics
  - 1.4. Process Variables
- 2.0. Pressure Measurement (08 Periods)**
- 2.0. Types of Pressure
  - 2.1. Measurement of Pressure by Manometers
  - 2.2. Diaphragms
  - 2.3. Bourdon Tube
  - 2.4. Bellows
  - 2.5. Differential Pressure Measurement
  - 2.6. Vacuum Measurement
  - 2.7. Dead weight Tester
- 3.0. Temperature Measurement (08 Periods)**
- 3.0. General
  - 3.1. Heat Transfer modes
  - 3.2. Temperature Measuring Devices Like Thermocouples.
  - 3.3. Pyrometer
  - 3.4. Resistance Thermometer.
  - 3.5. Thermistor
  - 3.6. Bimetallic Thermometer
- 4.0. Strain Measurement (06 Periods)**
- 4.0. Requirements for strain measurement
  - 4.1. Strain Gauges
  - 4.2. Selection of Gauges
  - 4.3. General Strain Measurement
  - 4.4. Load Cell
- 5.0. Vibration and Angular Velocity Measurement (08 Periods)**
- 5.0. Vibration Measurement Systems
  - 5.1. Analysis of acceleration data.
  - 5.2. Measurement of Angular Velocity
  - 5.3. DC & AC Tachometer Generators
  - 5.4. Digital Methods
  - 5.5. Stroboscope

## **6.0. Flow Measurement (08 Periods)**

- 6.0. General
- 6.1. Types of Flow
- 6.2. Flow Coefficient
- 6.3. Reynolds No
- 6.4. Flow Meters
- 6.5. Venturi Meter
- 6.6. Orifice Plate
- 6.7. Pitot Tube
- 6.8. Rotameter
- 6.9. Turbine Meter
- 6.10. Electromagnetic Meter & mass flow measurement

## **7.0. Liquid Level Measurements (06 Periods)**

Visual indicators, Float actuated level meters, static pressure type instruments. The bubbler system, diaphragm box and air trap system. Electrical contact type liquid level indicators.

## **8.0. Humidity, Moisture & Thickness Measurement (04 Periods)**

## **9.0. Chemical & Analytical Instruments (06 Periods)**

- 9.1. Spectrophotometer, Filters
- 9.2. Electrochemical Sensors
- 9.3. PH Meter
- 9.4. Analytical Sensor
- 9.5. Viscosity measurements by constant stress rotational viscometer & falling ball type viscometer.

## **10.0. Plastic Testing Instruments (05 Periods)**

Tensile testing machine, Melt flow index testing machine, Impact testing machine

## **INSTRUCTIONAL STRATEGY**

The teacher should take the students to some industries and show them these instruments so that they get a better knowledge of every instrument.

## **LIST OF PRACTICALS**

1. Experiment of Pressure Measurement
2. Experiment of Temperature Measurement
3. Experiment of Flow Measurement
4. Experiment of Humidity Measurement
5. To calibrate pressure gauge with the help of dead weight pressure gauge
6. Experiment on spectrophotometer and PH meter.
7. Measurement of Level
8. Measurement of angular velocity
9. To find out drying characteristics of given sample and draw drying rate curve by infrared moisture meter and rapid moisture meter.

## RECOMMENDED BOOKS

### List of Books

1. Instrumentation Devices & Systems –  
By S.Ranjan (Tata McGraw-Hill Publishing)
2. Electrical & Electronics Measurement –  
By A.K.Sawhney (Danpat Rai & Co.)
3. Industrial Instrumentation –  
By Tyson
4. Industrial Instrumentation –  
By Donald P.Eckman
5. Industrial Instrumentation –  
By S.K.Singh
6. Instrumentation –  
By Cirk & Rimboi
7. Instrumentation Measurement and Analysis –  
By B.C.Nakra and KK Chaudhary(MC Graw Hill Publication)
8. Electronics Instrumentation –  
By H.S. Kalsi (MC Graw Hill Publication)
9. Principles of Industrial Instrumentation  
By D. Patronalis, Tata McGraw Hill Publication

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted (Hrs) | Marks Allotted (%) |
|--------------|---------------------|--------------------|
| 1            | 05                  | 05                 |
| 2            | 08                  | 10                 |
| 3            | 08                  | 15                 |
| 4            | 06                  | 10                 |
| 5            | 08                  | 10                 |
| 6            | 08                  | 10                 |
| 7            | 06                  | 10                 |
| 8            | 04                  | 10                 |
| 9            | 06                  | 10                 |
| 10           | 05                  | 10                 |
| <b>Total</b> | <b>64</b>           | <b>100</b>         |

### 3.3 FLUID MECHANICS

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#### RATIONALE

The knowledge of fluid flow is very essential because all chemical plants have fluid flow operations. The examples are flow of stream and gases in pipes, flow of liquid in pipes and open channels etc. This subject aims at the basic concepts of fluid flow, measurement techniques involved for the same and equipment used for the transportation of fluids. With this background, students will be able to find out quantitatively material and power requirements for a process.

#### DETAILED CONTENTS

- 1. Classification of fluids:** (02 Periods)  
Compressible fluids, incompressible fluids, Newtonian and Non-Newtonian fluids, Properties of fluids (only definitions), mass density, weight density, vapour pressure, specific gravity, viscosity, surface tension, compressibility, thermal conductivity, specific volume.
- 2. Various types of flow:** (02 Periods)  
Steady and unsteady flow, uniform and non-uniform flow, streamline flow, laminar and turbulent flow
- 3. Various types of manometer:** (04 Periods)  
U-tube manometer, inclined manometer, differential manometer / two liquid manometer / Multiplying gauge, simple numerical problems.
- 4. Basic equations of fluid flow:** (18 Periods)  
Stream line and stream tube, Average velocity, Mass velocity, Equation of continuity, derivation of continuity equation, Bernoulli's theorem, derivation of Bernoulli's equation, Hagen Poiseulli's equation, friction factor chart, Fanning equation, friction losses in pipes, friction loss from sudden enlargement and contraction, friction losses in various types of fittings and valves, effect of roughness, Equivalent length, Form fiction losses in Bernoulli's equation, Simple numerical problems related to above topics.
- 5. Flow measurements:** (15 Periods)  
Classification of flow meters, principle, construction, working, derivation of flow equation, advantages, disadvantages of (i) Venturimeter (ii) Orifice meter (iii) Pitot tube (iv) Rotameter, difference between Orifice meter and Venturimeter, Measurement of flow in open channels, classification of notches, derivation of total discharge equation of Rectangular notch and V-Notch, advantages of V-Notch over rectangular notch.
- 6. Transportation of fluids:** (23 Periods)  
Classification of pipes and fittings, different types of pipes, tubes and fittings, Schedule number, Birmingham wire gauge (BWG), internal diameter and outer diameter of pipes, difference between pipe and tube,  
Classification of valves, gate valve, globe valve, ball valve, diaphragm valve, needle valve, butterfly valve,  
Classification of pumps,

(i) Centrifugal pumps, principle, construction or components of centrifugal pumps, working, advantages and disadvantages, Head of a centrifugal pump, priming, cavitation and Net Positive Suction Head (NPSH), power requirement and efficiency of centrifugal pump, characteristics curves, centrifugal pump troubles and remedies.

(ii) Positive displacement pumps, positive displacement pumps classification, Reciprocating pump, classification of reciprocating pumps, piston pumps, plunger and diaphragm pumps, single acting and double acting, Rotary pumps.

Comparison of centrifugal and reciprocating pump, advantages of centrifugal pump over reciprocating pump.

Centrifugal blowers, compressors, vacuum pumps: rotary vacuum pump, steam jet ejectors, water ejectors.

### **LIST OF PRACTICALS**

1. To determine the co-efficient of discharge of Orifice meter.
2. To determine the co-efficient of discharge of Venturi meter
3. To determine the co-efficient of discharge of V-Notches.
4. To determine the co-efficient of discharge of rectangular notches
5. To determine coefficient of velocity ( $C_v$ ). coefficient of discharge ( $C_d$ ), coefficient of contraction ( $C_c$ ) and verify the relation between them.
6. To determine frictional losses in pipes and fittings.
7. To determine the equivalent length of pipes and fittings.
8. To verify Bernoulli's Theorem.
9. To determine the efficiency of a centrifugal pump.
10. To determine point velocity in a pipe by Pitot tube.

### **INSTRUCTIONAL STRATEGY**

This syllabus is designed in such a way that the students get theoretical as well as practical knowledge about all the topics so that students should be first taught theoretical knowledge and then practical knowledge. The students may be asked to make files related to their experiments.

### **RECOMMENDED BOOKS**

1. Unit Operation of Chemical Engineering by McCabe and Smith; McGraw Hill Publication
2. Chemical Engineering Vol. I and II by Coulson and Richardson; Pergamon Press Publication
3. Introduction to Chemical Engineering by Badger and Banchemo; McGraw Hill Publication
4. Principles of Unit Operations by Foust John; Wiley Eastern Publication
5. Unit Operations by Brown, John Wiley Publications
6. Unit Operation – 1 (Fluid Flow and Mechanical Operations) by Gavhane KA; Nirali Prakashan



### SUGGESTED DISTRIBUTION OF MARKS

| <b>Topic No.</b> | <b>Time Allotted (Hrs)</b> | <b>Marks Allotted (%)</b> |
|------------------|----------------------------|---------------------------|
| 1                | 02                         | 05                        |
| 2                | 02                         | 05                        |
| 3                | 04                         | 10                        |
| 4                | 18                         | 25                        |
| 5                | 15                         | 20                        |
| 6                | 23                         | 35                        |
| <b>Total</b>     | <b>64</b>                  | <b>100</b>                |

### 3.4 PRINCIPLES OF POLYMERIZATION

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#### RATIONALE

This course is designed to enable the students to acquire basic knowledge of polymer chemistry & polymer physics for better understanding of other polymer-related courses. The acquired knowledge will help the students in identifying different polymeric material to be processed in the industry & determine their quality based on physical & chemical test. After going through this course students will be able to prepare & characterize plastic material.

#### Detailed Contents

1. Basic Concepts and Terminology such as monomer, polymer, functionality and structure of polymer (04 Periods)
2. Types & classification of polymers - Natural, semi synthetics, synthetics, linear, branched, cross linked, thermoplastic & thermosetting, copolymers, commodity plastics, engineering plastics, specialty plastics, polymer blends & alloys. (05 Periods)
3. Secondary bonding in polymers; Stereo - isomerism in polymers; physical states of polymers - amorphous & crystalline behaviour; concept of birefringence, dissolution & melting of polymers, solvent selection for polymers, miscibility & compatibility of polymers. (08 Periods)
4. Molecular weights & distributions, number average, weight average and viscosity average and their relations; determination of molecular weights by dilute solution viscometry, osmometry, Gel Permeation, chromatography, degree of polymerization, polydispersity. (08 Periods)
5. Glass transition temperature; its importance & the factor which influence it; techniques for its determination, melting temperature (04 Periods)
6. Concept of functionality & carother's equation for condensation polymerization, kinetics and mechanism, relationship between conversion & degree of polymerization gel phenomenon. (10 Periods)
7. Free radical polymerization; Different types of initiators, inhibition, retardation etc. Auto acceleration; ceiling temperature; ionic polymerization; Ziegler natta polymerization. (10 Periods)
8. Copolymerization reaction and its utility. Kinetics and copolymerization behaviour. Block and graft copolymers. Ring opening polymerization(10 Periods)
9. Stop Copolymerization and its utility (05 Periods)

## INSTRUCTIONAL STRATEGY

The course has been designed in such a way that the student can understand the basics of polymers clearly, thereby helping them in the advance course. Extension lectures by experts from polymer industry can enrich the students with better inputs regarding various types of techniques and latest developments in polymer industry.

## RECOMMENDED BOOKS

1. Polymer Science and Technology, by premamoy Ghosh Tata Mc Graw – Hill Publication.
2. Polymer Chemistry by Paave
3. Text Book of Polymer Science by Billmeyer
4. Polymer Science and Technology by Joel R.
5. Polymer Science by Gowariker
6. Principles of Polymerization by Odian
7. Polymer Science and Technology by Fried, Prentice Hall of India, Publication

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted (Hrs) | Marks Allotted (%) |
|--------------|---------------------|--------------------|
| 1            | 04                  | 05                 |
| 2            | 05                  | 10                 |
| 3            | 08                  | 10                 |
| 4            | 08                  | 15                 |
| 5            | 04                  | 05                 |
| 6            | 10                  | 15                 |
| 7            | 10                  | 15                 |
| 8            | 10                  | 15                 |
| 9            | 05                  | 10                 |
| <b>Total</b> | <b>64</b>           | <b>100</b>         |

### 3.5 MECHANICAL OPERATIONS

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#### RATIONALE

This subject gives the knowledge of working of individual mechanical operations and their significance in chemical industries. With this information, students, learn about the control of operation of equipment and regulate production.

#### DETAILED CONTENTS

- 1. Introduction:** (04 Periods)  
Concept and role of unit operation in industries, force, pressure, work, power, heat.
- 2. Size Reduction (Comminution):** (15 Periods)  
Size reduction, necessity of size reduction, principles of size reduction, characteristics of size reduced/ comminuted product, expression for power required by machines, Rittinger's law, Kick's law, Bond's law and work index, simple numerical problems.  
Size reduction equipment:  
Classification of size reduction equipment, general description of crushers: Jaw crusher, Gyratory crusher, Roll crusher, Grinders: Hammer mill, Ball mill, critical speed of Ball mill, difference in crushing and grinding, Equipment operation: (i) Open circuit (ii) Closed circuit.
- 3. Characterization of solid particles:** (15 Periods)  
Characterization of solid particles, particle shape, sphericity, particle size, particle size measurement by screen analysis, mesh, screen aperture or screen size opening, differential and cumulative methods of analysis of particle size, specific surface of mixture, average particle size, number of particles in a mixture.  
Screen analysis: Tyler standard screen series (or US sieve series), screening, types of screening equipment their construction, working, vibrating screens, Grizzlies and Trommels, comparison of Grizzlies and Trommels.
- 4. Handling of solids:** (10 Periods)  
Mechanical and pneumatic conveying equipment, classification of conveying equipment, general construction, working and industrial application of Belt conveyors, Chain conveyors, Bucket conveyors, Bucket elevators, Screw conveyors, Pneumatic conveyors.
- 5. Mechanical separations:** (15 Periods)  
Filtration and sedimentation: define filtration, filter medium, characteristics of filter medium, filtrate, filter aids, characteristics of filter aids.  
Types of filtration: (i) cake filtration (ii) deep bed filtration  
Classification of filter equipment: (i) clarifying filter (ii) cake filter. Clarifying filter- principle, construction, working and industrial application of pressure filters: plate and frame filter press, rotary drum filter, leaf filter, sand filter.  
Classifiers, thickeners, centrifugal filtration – centrifuge.

- 6. Mixing equipment:** (05 Periods)  
Utility of mixing, mixing equipment used for liquid-liquid, liquid-solid, liquid-gas systems, impellers, propellers, turbines, flow pattern in agitated vessels, vortex formation and its prevention.

### LIST OF PRACTICALS

1. To find the sieve analysis of a given sample of solid particles by sieve shaker.
2. To determine the grind ability of solids by ball mill.
3. To determine the effectiveness of disintegrator.
4. To find the rate of filtration with the help of filter press.
5. To determine the rate of settling of slurries of various concentration. Draw a height vs. time curve.
6. To determine the efficiency of jaw crusher.
7. To perform an experiment on rotary vacuum filter and find rate of filtration.

### INSTRUCTIONAL STRATEGY

Mechanical operation has significant importance in the area of chemical engineering. Adequate competency needs to be developed by giving sufficient practical knowledge in mechanical operation (characterization of solid particles, size reduction, energy requirement and mechanical separations) A field visit may be conducted to expose the working of various conveyors and filtration equipment in industries.

### RECOMMENDED BOOKS

1. Unit Operations of Chemical Engineering by McCabe and Smith, McGraw Hill Publications.
2. Chemical Engineering, Vol. I & II by Coulson and Richardson, Pergamon Press Publications.
3. Introduction to Chemical Engineering by Badger and Banchero, Tata McGraw Hill Publication.
4. Principles of Unit Operations by Allen Fourst, John Wiley Publication.
5. Unit Operations by Brown, C.G., John Wiley Publication.
6. Unit Operation – 1 (Fluid Flow and Mechanical Operations) by Gavhane KA; Nirali Prakashan.

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted (Hrs) | Marks Allotted (%) |
|--------------|---------------------|--------------------|
| 1            | 04                  | 10                 |
| 2            | 15                  | 20                 |
| 3            | 15                  | 20                 |
| 4            | 10                  | 15                 |
| 5            | 15                  | 20                 |
| 6            | 05                  | 15                 |
| <b>Total</b> | <b>64</b>           | <b>100</b>         |

### 3.6 ELEMENTS OF PAINT TECHNOLOGY

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#### RATIONALE

The subject has been designed to give an overview of branch chemical technology (Paint), its important and use in different industry. The subject also deals with different surface coating, details about oils, driers, plasticizers & solvents used in paint industry.

#### DETAILED CONTENTS

- 1. Introduction** (12 Periods)  
General introduction of paint industry, definition of paints, varnishes and lacquers, their constitution and functions, general classification of surface coating, mechanism of film formation Overview of branch chemical Technology(Paint) importance of branch, different elements of Paint Technology, introduction of paint industry, use of chemical technology(Paint) in following chemical and allied industries, Research Organization & Laboratories like (Explain in brief)
  1. Pigment Industry
  2. Steel plant
  3. Cosmetic Industry
  4. Cosmetic industry
  5. Paint Industry
  6. Dye Industry
  7. Pulp and Paper industry
  8. Automobile Industry
  9. Consumer goods industry
  10. Polymer industry
  11. Coating Industry
  12. Leather industry
  13. Pharmaceutical industry
  14. Paint and dye industry
  15. Rubber industry
  16. Textile industry
  17. Research Organisation like CSIR Laboratories, Defence Laboratories & Atomic Energy Establishments
- 2. Basic of Paints Elements** (10 periods.)  
definition of paints, varnishes and lacquers, their constitution and functions, general classification of surface coating, mechanism of film formation,
- 3. OILS** (12 periods.)  
Source and composition of oils, non-glyceride, components of oils, classification, extraction and refining of oils. Properties and uses of some commonly used drying, semi drying oils, yellowing of oils, modified oils like heat treated oils, malenised oils, Copolymerised oils, Dehydrated castor oils, isomerizes oils.
- 4. PROPERTIES OF OILS**  
General properties of oil like oxidation, thermal polymerization, hydrolysis, glycerolysis, saponification etc. Physical and Chemical oxidation of oils, use of modern analytical technique such as UV, GEL, etc. deficiencies of oil film.  
(12 periods.)

## 5. **DRIERS**

Introduction of driers, types of driers like primary and secondary, functions of metal as well as acid part of driers, mechanism of drying action (12 periods.)

## 6. **Plasticizers:**

Definition, importance, mechanism of plasticization, types of plasticizers. (10 periods.)

## 7. **Solvents:**

Types of volatile solvents, general properties of solvents like solvent power, toxicity, rate of evaporation, boiling point, aromatic content, flash point, surface tension and viscosity. (12 periods.)

## **LIST OF PRACTICALS**

1. To check colors of oils
2. To determine specific gravity of oils (drying, semidrying and non-drying).
3. To check the form and condition of pigment.
4. To determine the moisture content of pigment.
5. To determine the viscosity of paint/primer by FORD cup no 04.
6. To check the flash and fire point of solvent.

## **INSTRUCTIONAL STRATEGY**

This is the first basic course for paint technology students . So basics should be clearly mentioned for better understanding of the subsequent paint subjects. Properties and types of coatings like varnishes, paints and lacquers should be highlighted and sample should be shown for better understanding.

## **RECOMMENDED BOOKS**

1. Organic Coating Technology Vol. I & II by HY, Payne
2. Surface Coating Technology Vol. I & II by OCCA, Australia
3. Outline of Paint Technology by W.M. Morgan

## **SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (Periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| 1                | 12                             | 10                        |
| 2                | 10                             | 10                        |
| 3                | 12                             | 20                        |
| 4                | 12                             | 15                        |
| 5                | 12                             | 15                        |
| 6                | 10                             | 15                        |
| 7                | 12                             | 15                        |
| <b>Total</b>     | <b>80</b>                      | <b>100</b>                |