MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN SURFACE COATING TECHNOLOGY

COURSE CODE : SC

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2014-15**

SEMESTER : THIRD **DURATION : 20 WEEKS**

PATTERN : FULL TIME – SEESTER **SCHEME : G**

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (17300)
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Project and Seminar on Inplant Training	IPT	17046	--	--	40	--	--	--	--	--	100#	40	100@	40	--
			TOTAL	**--**	**--**	**40**	**--**	**--**	**--**	**--**	**--**	**100**	**--**	**100**	**--**	**--**

Student Contact Hours Per Week: **40 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 200**

@ Internal Assessment, # External Assessment, $ – Common to All Conventional Diploma, No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subject are to be converted out of 50 marks as sessional work.
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN SURFACE COATING TECHNOLOGY

COURSE CODE : SC

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2014-15**

SEMESTER : FOURTH **DURATION: 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO.	SUBJECT TITLE	Abbre viation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (17400)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Environmental Studies $	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	50
2	Principles of Management	POM	19421	03	--	--	03	100	40	--	--	--	--	25@	10	
3	Technology of Paints - I	TOP	19422	03	--	04	03	100	40	50#	20	--	--	25@	10	
4	Application & Evaluation of Paints-I	AEP	19423	03	--	03	03	100	40	50#	20	--	--	25@	10	
5	Allied Surface Coating	ASC	19424	03	--	03	03	100	40	--	--	--	--	25@	10	
6	Professional Practices - I	PPR	19062	--	--	03	--	--	--	--	--	--	--	50@	20	
			TOTAL	**13**	**--**	**15**	**--**	**450**	**--**	**100**	**--**	**--**	**--**	**175**	**--**	**50**

Student Contact Hours Per Week: **28 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 775**

@ Internal Assessment, # External Assessment, $ - Common to All Conventional Diploma, [ ] No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subject are to be converted out of 50 marks as sessional work.
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name **: Diploma in Surface Coating Technology**

Course Code **: SC**

Semester **: Third**

Subject Title **: Project and Seminar on Inplant Training**

Subject Code **: 19046**

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
--	--	40	--	--	--	100#	100@	200

***** 40 hrs per week for 20 weeks

Rationale:

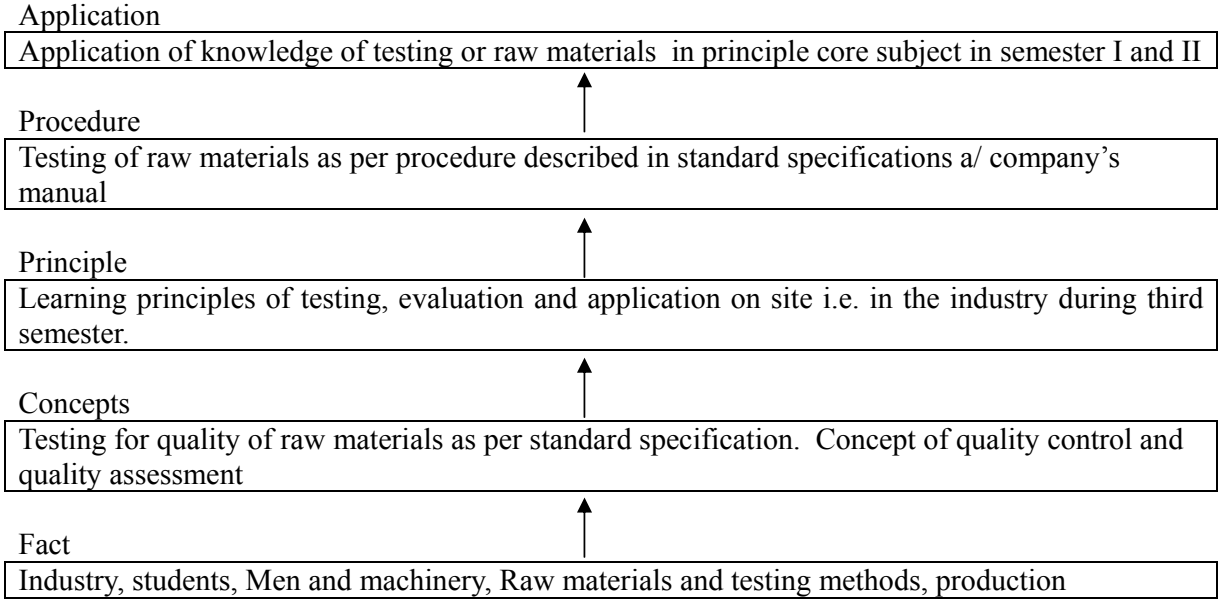
The third semester training of students is arranged in a raw materials, paint manufacturing or allied company, where the students may learn about the raw materials, their testing, properties etc., in a professional manner. The industrial training provides an opportunity to students to actually see and use sophisticated instruments. Reliability & repeatability of testing results. Calibration of Instruments. The training also provides an opportunity to get accustomed to the industrial work atmosphere.

Objectives:

Student will be able to:

1. Learn uses of various raw materials
2. Describe selection of raw materials for resin, paint industries
3. Perform testing of raw materials.

Learning Structure:



TRAINING: General guide lines

General:

1. Duration of training covers 20 weeks
2. The in-plant training is approved by the Board of Apprenticeship Training. (BOAT)
3. The third semester training will usually be from June to October every year
4. The students will be placed in a raw materials/manufacturing company related to surface coating for training.

Role of Students

1. During the training period the student has to be regular and punctual in his duties
2. The students will follow all rules, regulations and instructions prescribed by the company management
3. He/she will get a chalked out training program for the training period
4. The student has to show keen interest in learning practical aspects of the principles that has been studied in theory classes in earlier semesters.
5. With the permission of authorities, students will keep day to day records (diary) of the actual work carried out by him. Such information helps the students preparing the report for exam.
6. The 3rd sem. students a carry out work relating to testing of raw materials used in paint and coatings in the industry quality of raw materials. Be in regular touch
7. The students are expected to learn how to judge the quality of raw materials for paints and coatings
8. The student is expected to learn the testing of pigments, resins, solvents etc.

Role Industry

1. The company will see to it that the students is exposed to various departments especially testing and evaluating surface coating materials technology
1. The students can get in touch with the Institute any time for any help and guidance
2. The institute will be in touch with the industry as regards the performance of the students during training. Regular feedback will be obtained from the industry.

Examination

1. The students fulfilling the eligibility criteria for appearing IIIrd Semester examination as per MSBTE rules, will be allowed to appear for final examination on Project & Seminar on Inplant training for this semester
2. Students will have to submit his diary of training period along with final project report to the Institute on or before prescribed date.
3. As per examination scheme, student will be evaluated during his examination by internal & external examiner

SKILLS TO BE DEVELOPED

Intellectual skills

1. Getting acquainted with the factory routine
2. Setting up and running a continuous on-going process to acquire experimental skill in gravimetric, volumetric a
   Analytical & visual skills
3. Handling and controlling sequential operations

PROJECT REPORT

1. After satisfactory completion of the training of the student, the student will be given about one week to submit in-plant training report
2. The report must be type written (computer copy) A-4 size bond paper and running in nearly 30 – 40 pages with proper margin and line spacing.
3. The report must include actual work done by the student during the training period. The raw materials tested, tests carried out by him, results obtained.
4. Before writing of final report, students will prepare handwritten manuscript and will get it certified with company Official. Based on this student shall prepare the final project report on the work actually he carried out in industry
5. The report should contain only the information which is permitted by the factory. A copy of the report must be submitted to the company.
6. The report must be accompanied by a certificate from the company authorities regarding completion of the training by the student. (A photocopy of the certificate maybe attached in the report and original certificate must be preserved for the final examination.
7. The report must also be accompanied by the student's submission and institutes certificate.
8. With the permission of the factory, the student may attach / submit samples specimens, photographs panels along with the reports in deliver order to make the report more effective.
9. The students have to the seminar in presence of students and examiners. He will be evaluated by the external examiners on the basis of seminar talk and the report submitted by him.

FORMAT OF THE PROJECT REPORT

1. Contents
2. Acknowledgement and certificate
3. Introduction to the company
4. Brief details about the training program
5. Products manufactured by the company
6. Testing /evaluation methods
7. Actual work done by the student. This should be in details. The report should be such that it should cover the actual work done by the students, and details of testing carried out. The content of the report should not have directly taken form the text books, industry website & company presentation etc.
8. The report must also have necessary diagrams and photographs to make understanding clear and effective.
9. The students should give his observations and suggestions.

EXAMINING

1. The students must have complete knowledge about everything covered in the report
2. He/she must show confidence while delivering the talk as well answering questions
3. The performance of the students will be evaluated by external and internal examiners on the basis of the training report and the presentation made in the hall before students and examiners.
4. Evaluation will be carried out by External & Internal examiner on following aspects
    a) Content of Presentation
    b) Sequence in presentation
    c) Presentation skill
    d) Questions & answers.

Course Name: All Branches of Diploma in Engineering & Technology

Course Code : AE/CE/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/ME/ MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/AU/FG/AA/DD/GT/ ML/FC/PN/PC/SC/TR Sixth for PC

Semester : Fourth

Subject Title : Environmental Studies

Subject Code : 17401

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25 @	75

#* Online Theory Examination

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

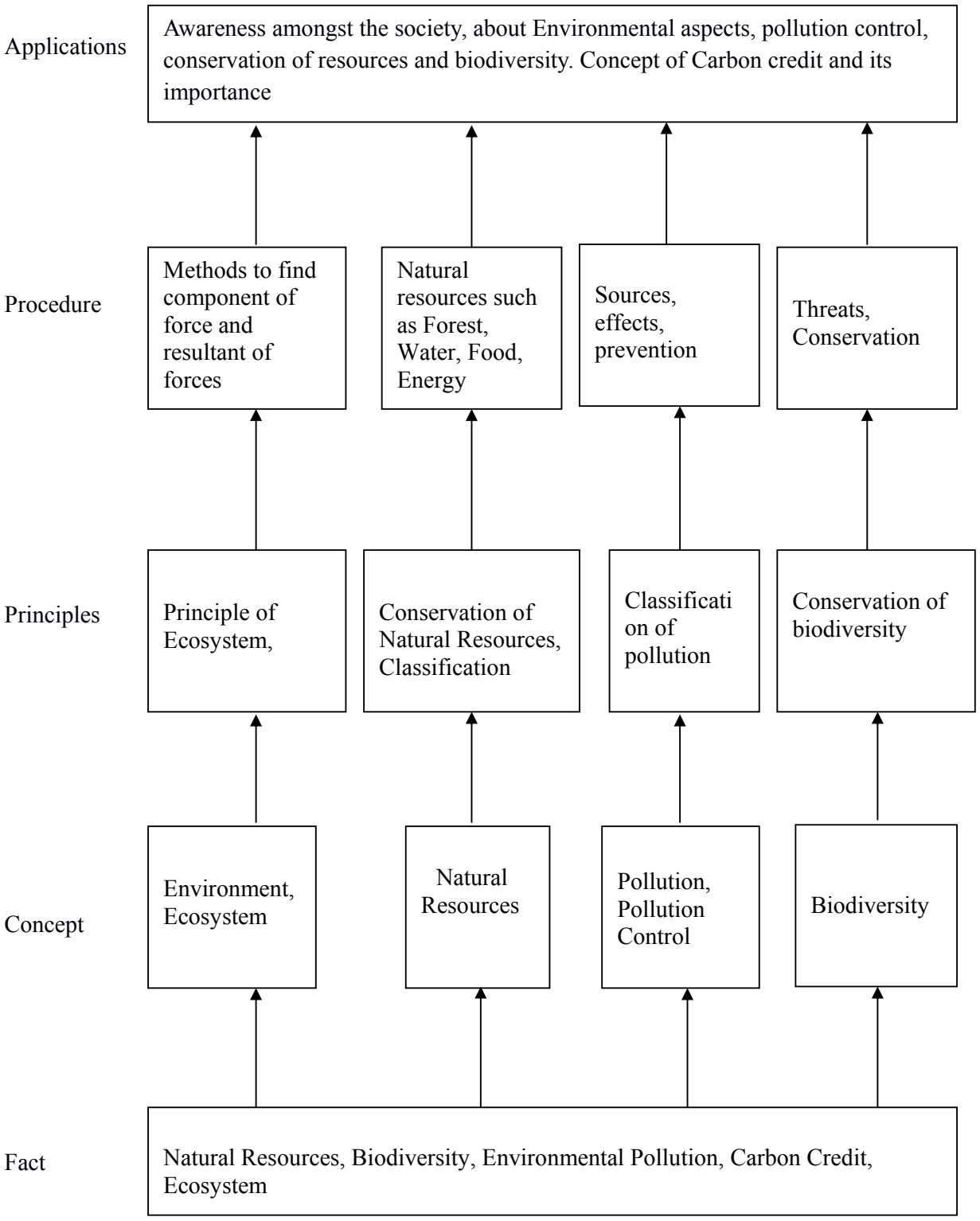
It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

General Objectives: The student will be able to**,**

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: Nature of Environmental Studies Specific Objectives: ➢ Define the terms related to Environmental Studies ➢ State importance of awareness about environment in general public **Contents:** • Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues	01	04
Topic 2: Natural Resources and Associated Problems Specific Objectives: ➢ Define natural resources and identify problems associated with them ➢ Identify uses and their overexploitation ➢ Identify alternate resources and their importance for environment **Contents:** 2.1 Renewable and Non renewable resources • Definition • Associated problems 2.2 Forest Resources • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. 2.3 Water Resources • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and community 2.4 Mineral Resources: • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment 2.5 Food Resources: • Food for all • Effects of modern agriculture • World food problem	04	10
Topic 3. Ecosystems • Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world	01	04
Topic 4. Biodiversity and Its Conservation • Definition of Biodiversity • Levels of biodiversity • Value of biodiversity	02	06

• Threats to biodiversity • Conservation of biodiversity		
Topic 5. Environmental Pollution • Definition • Air pollution: Definition, Classification, sources, effects, prevention • Water Pollution: Definition, Classification, sources, effects, prevention • Soil Pollution: Definition, sources, effects, prevention • Noise Pollution: Definition, sources, effects, prevention	03	08
Topic 6. Social Issues and Environment • Concept of development, sustainable development • Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits • Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate • Concept of Carbon Credits and its advantages	03	10
Topic 7. Environmental Protection Brief description of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights	02	08
Total	**16**	**50**

Practical:
Skills to be developed:

Intellectual Skills:

1. Collection of information, data
2. Analysis of data
3. Report writing

Motor Skills:

1. Presentation Skills
2. Use of multi media

List of Projects:

Note: Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc.

Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

Course Name **: Diploma in Surface Coating Technology**

Course Code **: SC**

Semester **: Fourth**

Subject Title **: Principles of Management**

Subject Code **: 19421**

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

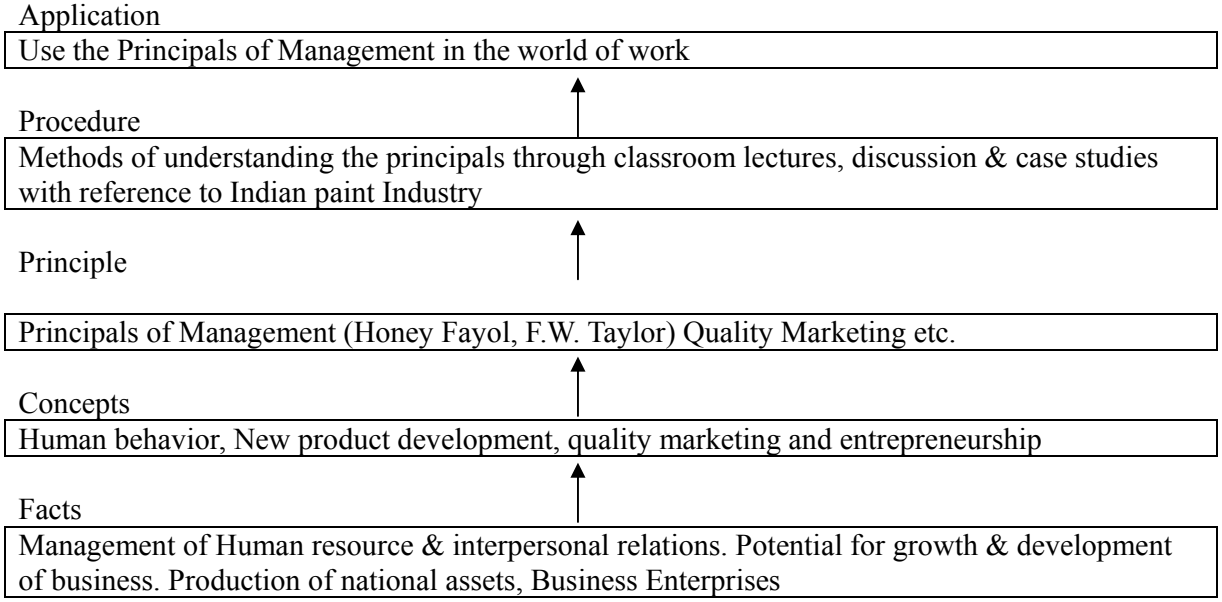
Rationale:

This subject will help the students in understanding principals & techniques of Management & Process of business development as an entrepreneur. This subject will also stress the importance of Interpersonal relations

Objectives:

1. Student will be able to understand the importance of Interpersonal relations
2. Develop communications skills & leadership qualities
3. Develop Managerial & entrepreneurship skills

Learning Structure:



Contents: Theory

Name of the Topic	Hrs.	Marks
Organization & Human Behavior **Specific Objectives:** ➢ Describe history of Management thoughts ➢ Explain the types of organizations ➢ Distinguish between authority & responsibility & give examples 1.1 Introduction, History of Management thoughts, Functions of management, Importance of organization, definition, formal organization, Informal Organization, Organization Charts **Marks: 12** 1.2 Authority & Responsibility, Kinds of authority, causes of conflict between line & staff delegation of authority, responsibility & accountability **Marks: 08**	10	20
New Product Development **Specific Objectives:** ➢ Describe the Significance & classification of new product ➢ Explain the stages in the development of new product ➢ Explain the reasons for new product failure 2.1 Significance of New product development, Classification of new products, stages in product development **Marks 10** 2.2 Estimate the demand for new products, Pricing strategy for new products, reasons new Product failure **Marks 10**	08	20
Quality Management **Specific Objectives:** ➢ State the term quality, define quality concepts ➢ Explain the importance of standardization of testing methods ➢ Describe the term Zero defect & method to achieve it. ➢ Define the terms quality circles, TQM, ISO 9000 & Six sigma & their applications 3.1 History of quality Concepts, Importance of Testing, perception at each stage, reducing wastages **Marks: 04** 3.2 Standardization of testing methods, working towards zero defects **Marks:08** 3.3 Concepts & Importance of quality Circle, total quality Management, ISO 9000 & Six sigma **Marks: 08**	10	20
Marketing Management **Specific Objectives:** ➢ Define the term marketing management, ➢ Explain the task & philosophy of marketing management ➢ State the difference between consumer market, Industrial market ➢ Explain the latest trends of marketing a product 4.1 Definition, conceptualizing marketing management, task & glossary of marketing management, Task & Philosophy of Marketing Management **Marks: 08** 4.2 Consumer market, Industrial market & buyers behavior **Marks: 06** 4.3 Product mix & brand strategy, latest trends to promote/marketing a new product **Marks: 06**	10	20
Entrepreneurship **Specific Objectives:** ➢ Define different types of Entrepreneur ➢ Explain the method of preparation of project report & stages	10	20

involved. ➢ Explain the significance of plane location with respect to factors affecting selection process 5.1 Proprietorship, Partnership, Cooperative & public sector, government undertaking **Marks: 06** 5.2 Project & feasibility report, Small scale Industry, Registration & other formalities, project planning, Technical & marketing feasibility **Marks: 08** 5.3 Plant Location specially w.r.to Paint Industry **Marks: 06**		
Total	**48**	**100**

Learning Resources :
Books:

Sr. No.	Author	Title of the Book	Publisher
1	Peter F Drucker	The Practice of Management	Allied publishers Ltd
2	O P Khanna	Engineering and Management	Ganpat RAi Publications
3	C D Mamori	Personnel Management	Himalaya Publishing
4	P C Shejwalkar	Principles and Practice of Management	Everest Publishing House
5	Treveor L young	Successful Project Management	Konya Page India P ltd
6	V S Ramaswamy	Marketing Management	McMillan India Ltd

Course Name : Diploma in Surface Coating Technology

Course Code : SC

Semester : Fourth

Subject Title : Technology of Paints - I

Subject Code : 19422

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
03	--	04	03	100	50#	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

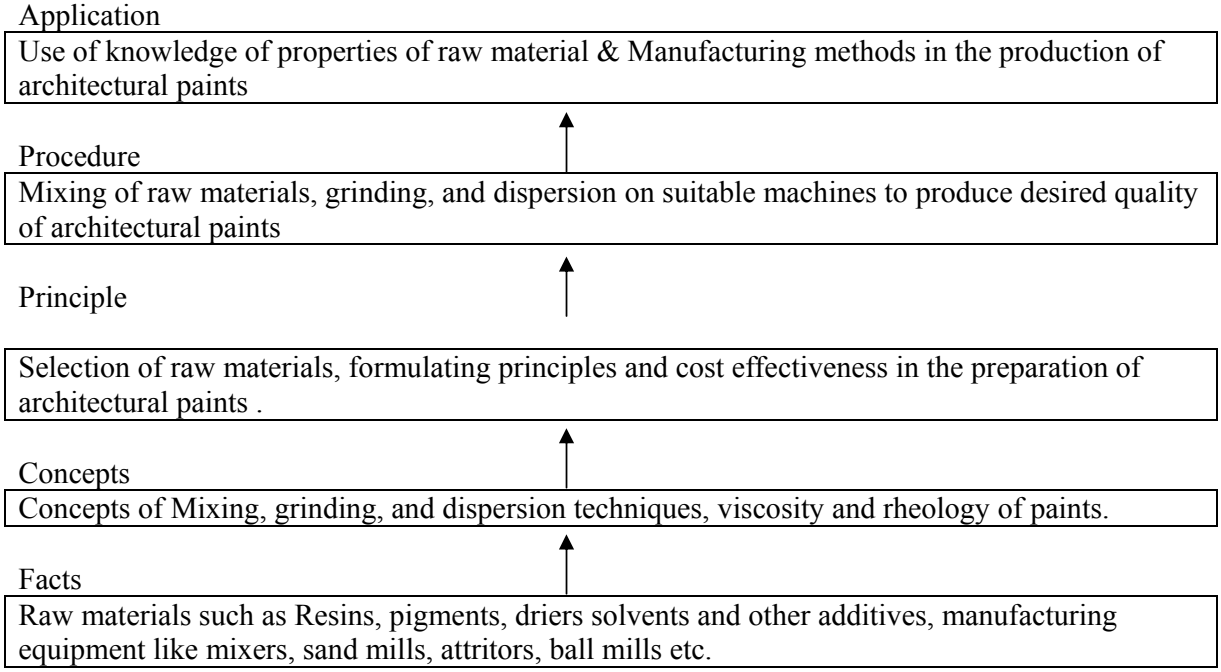
This is a core subject of the course of Surface coating technology. In this subject the student will learn technological aspects in the preparation of Paint. They will learn various types of Paints, different raw materials, their properties & compatibility with each other so as to produce the right type of paint as per the end use

Objectives:

Student will be able to:

1. Identify raw materials of paints
2. Describe significance of various terms like P:B ratio, PVC, CPVC
3. Design formulations of architectural Paints

Learning Structure:



Contents: Theory

Topic and Contents	Hrs.	Marks
Topic 1: Introduction to Paints & raw materials: **Specific Objectives:** ➢ Define the term paints & describe role of ingredient in it ➢ With neat sketches explain classification of paints ➢ explain the role of thinners & properties affecting on properties of paint 1.1 Raw materials used in paints and their functions in the formulation. Classification of paints such as architectural paints, industrial paints, water based paints and solvent based paints, Drying based, function based formulations. Marks: 12 1.2 Types of thinners and solvents used in paints. Various of types of paints such a putty, surface. Intermediate coats and top coats etc. Marks: 08	10	20
Topic 2: Paint Additives **Specific Objectives:** ➢ Define the term surfactant ➢ Explain the term polarity & how it affects activity of surfactants ➢ Explain the classification of surfactants ➢ Explain the use of surface active agents in the form of different additives 2.1 Surface active agents- Definition, polarity of surfactant & its effect on the properties, Classification of surfactant & their roles in Paints Marks: 08 2.2 Matting & dispersing agents, Antisettling agents, Antiskinning agents, Matting agents, Emulsifiers, stabilizers, preservatives, Mild dew Inhibitors, Viscosity Modifiers, Universal Tinters Marks: 12	12	20
Topic 3: Paint formulation- **Specific Objectives:** ➢ Define the basic terms used in the formulating principals ➢ Explain the effect of P/B ratio, NVM, PVC, CPVC etc. on the properties of film ➢ Explain the parameters involved in formulating principles of paints. ➢ Prepare the suitable formulations with roles of ingredient used in it 3.1 Important Properties of Paints, their significance & method to achieve. P:B ratio, NVM, Coverage, PVC & CPVC and their effect on paint film properties. Concept of Raw material Cost Marks: 08 3.2 Formulating Principals of Paints, Formulation of primer for wood, metal & Cement. Formulation of Enamels-Interiors & exterior. Paints for Plaster & Masonry- Architectural Paints Marks: 12	10	20
Paint Machines, plant layout and Manufacturing **Marks 20** **Specific Objectives:** ➢ Describe the principal of dispersion of Paint ➢ Explain the stages involved in manufacturing of paint ➢ Sketch the neat labeled diagram & explain the principle and working of various grinding mills ➢ With neat labeled diagram explain the significance of vertical & horizontal layout of plant 4.1 Machinery used in Paint Industry such as Mixers, Ball Mill, Sand Mill,	08	20

Attritor, Basket Mill, Horizontal mill, Dispersion techniques Marks:12 4.2 Plant Layout- Location, material storage & Handling, Processing, Horizontal & vertical Layout Marks:08		
Quality Assurance **Specific Objectives:** ➢ Describe the significance of quality parameters in paint ➢ Explain the methods working towards zero defect ➢ Describe the various essential tests that affect the quality of paint ➢ Explain the concept of Shade matching **5.1 Quality Parameters**, Marks : 12 working towards zero defect, need for periodic testing, durability & life of paint **5.2 Important tests** Marks : 08 Tests that must be carried out frequently during manufacturing, post manufacturing, and at customers end. Shade matching-Manual & by spectrophotometer.	08	20
Total	**48**	**100**

PRACTICAL:
Skills to be developed:

Intellectual Skills:

1. Understand the requirements of industrial coatings based on service conditions.
2. Understand the qualities and properties of raw materials.
3. Understand & apply formulating principles of industrial coatings.
4. Select dispersing machinery.

Psychomotor Skills:

1. Handle, weighing and sequential addition of raw materials.
2. Control optimum process parameters.
3. Judge the end point stage wise.
4. Enforce safety rules.

List of Experiments: [Minimum 10 experiments to be completed)
To Prepare & Test:

1. A Sample of Putty/lambi/KPF (Knifing paste filler)
2. A sample of Dry Distemper
3. A sample of Emulsion paint
4. A Sample of Cement paint
5. A Sample of Cement primer
6. A Sample of Wood primer
7. A sample of Red oxide primer
8. A Sample of Interior enamel paint
9. A Sample of exterior enamel paint
10. A sample of lusture paint
11. A sample of Universal stainer
12. A Sample of NC lacquer for wood

Learning Resources:
Books:

Sr. No	Author	Title of the Book	Publisher
1.	O C C A Australia	Surface Coatings, Vol. II Paint & their Applications	Tafe Educational Books
2.	R Wood bridge	Principles of Paint formulations	Chapman & Hall
3.	J Boxall & J A Vonfraunhofer	Paint formulations-Principles & Practice	Industrial Press Inc. New York
4.	Gordon Fettis	Automotive Paints & Coatings	BCH Publishers Inc.
5.	Guy E. Weismantel	Paint Handbook	McGraw Hill Inc.
6.	Swaraj Paul	Surface Coatings	Hohn Wiley & Sons

Course Name : Diploma in Surface Coating Technology

Course Code : SC

Semester : Fourth

Subject Title : Applications & Evaluation of Paints - I

Subject Code : 19423

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
03	--	03	03	100	50#	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

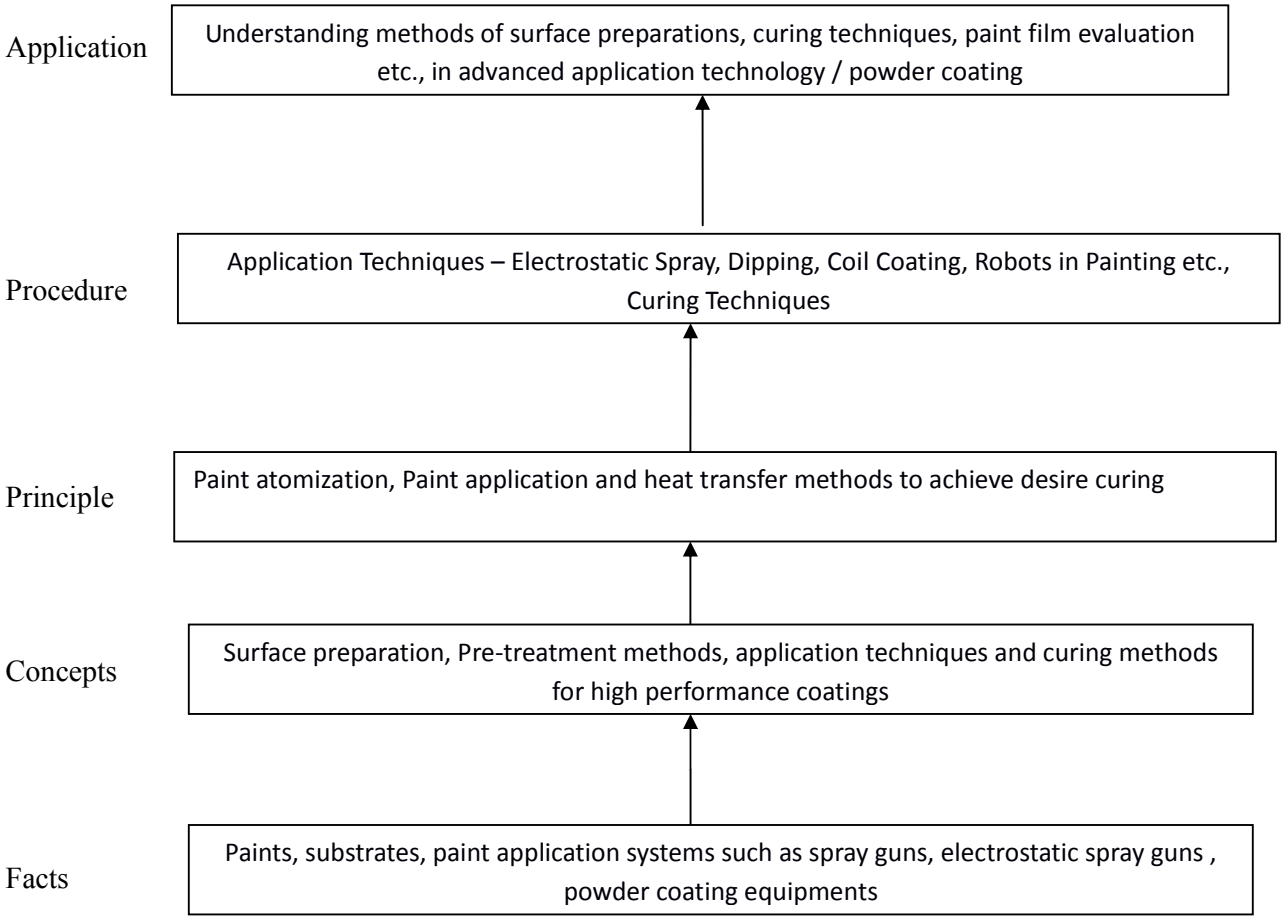
This subject will give an insight to students regarding advanced paint application methods such as Electrostatic Spray Painting, Micro Bell Paint Application, Robotic Paint application, Powder Coating etc. It will also give an insight as regards the curing methods and important properties, paint much possess in order to have excellent finish and durability

Objectives

Student will be able to:

1. Describe various properties of paint.
2. Describe advanced paint application techniques
3. Identify causes of paint failure

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1: Paint Properties: **Specific Objectives:** ➢ State & explain the rheological behavior of paint ➢ State physical testing on the wet paint & film properties of paint ➢ Use of physical properties for selection of application equipments **1.1 General** **Marks : 08** Significance of Paint testing, Rheological properties of Paint (Newtonian & non-Newtonian), examples of paint with reference to Newtonian & non Newtonian flow, Role of rheology in paint manufacture & application **1.2 Physical properties** **Marks : 12** such as wt/lit, NVM, fineness of grind, skinning, settling, wet film thickness, drying time, dilution ratio, covering power, hiding power & study of Indian specification IS 101 with reference to determination of physical properties & their effect on film properties. testing of solvents & effect of solvent properties on paint application	08	20
Topic 2: Testing Mechanical Properties of Dry film : **Specific Objectives:** ➢ State & explain the term Δ E, to determine it ➢ Explain the significance of testing of Gloss at various angles ➢ Describe the testing of mechanical properties of paint film & significance of accuracy in testing **2.1 Dry film Properties:** **Marks : 08** Measurement of color & Δ E, gloss at 20^0, 45^0 & 60^0 , finish, DOI, **2.2 Mechanical Properties** **Marks : 12** Paint film adhesion, cross cut adhesion, Tape test, conical mandrel, flexibility, resistance to scratch hardness, nail hardness, pencil hardness, rocker hardness, resistance to Impact, abrasion	12	20
Topic 3: Evaluation of Performance Properties of Dry film: **Specific Objectives:** ➢ State & explain the term Δ E, to determine it ➢ Explain the significance of testing of Gloss at various angles for different types of finishes ➢ Describe the testing of mechanical properties of paint film & significance of accuracy in testing **3.1 Performance Properties** **Marks: 12** Resistance to salt spray, water immersion, humidity, exposure to high & low temp., Resistance to Chemicals such as acids, alkali, salt, lubricating oil, petroleum hydrocarbon solvent. Resistance to yellowing, bleeding, mould growth **3.2 Electrical Properties:** **Marks : 08** Insulation resistance, breakdown voltage, pin hole testing & cut through temperature for insulating varnishes	08	20
Surface Preparation: **Specific Objectives:** ➢ State & explain the significance of Surface preparation ➢ Explain the surface preparation methods for different types of substrate	10	20

➢ Describe the types of failures due to poor surface preparations with respect to substrates masonry, wood, flooring **1.1 Nature of substrate** **Marks : 10** concrete plaster, flooring, wooden surfaces, plywood, hardwood **1.2 Surface preparation methods** **Marks : 10** Surface preparation methods & their advantages. Failure of Paints because of improper surface preparation		
Application Techniques: **Specific Objectives:** ➢ State the types of brushes & Rollers available& explain their effect on application ➢ Explain the significance of testing of Gloss at various angles for different types of finishes ➢ Describe the testing of mechanical properties of paint film & significance of accuracy in testing **5.1 Types of brushes & Rollers**. **Marks : 10** Application by brushing, Flow & leveling, advantages & disadvantages of brush & Roller applications, **5.2 latest trends in paint application** **Marks : 10** latest trends in paint application using spatula, special foams etc. to create special multicolor effect, Use of Putty knife, application of dry distemper, OBD & plastic emulsion, wet age time, time of application of second coat, wet on wet application	10	20
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand paint testing specifications
2. Select material, apparatus and equipments for evaluation of paint
3. Optimize process parameters and curing schedules

Psychomotor Skills:

1. Prepare substrates for painting
2. Follow norms for respective painting processes
3. Assemble application equipment
4. Handle and dispose hazardous waste material

List of Experiments: [Minimum 10 experiments to be completed)

To Measure: (as per ISS where applicable)

1. Check viscosity of paint using ford cup B-4 viscometer, Brook field viscometer, stormar viscometer

2. Determine Viscosity of lacquer/alkyd using Gardner tube & brook field & their correlation

3. Prepare the panel as per IS Specification
4. Determine Hiding & Opacity of Paint
5. Measure Wet film thickness, drying time of sample of paint
6. Calculate dry film thickness from WFT & NVM of Paint
7. Determine DFT and gloss of the paint & check color, finish of coating
8. Check flexibility & adhesion by conical mandrel, cross-cut adhesion methods
9. Determine hardness of paint using Scratch hardness, Impact hardness, pencil hardness
10. Test resistance to water/solvents/acid/alkali of paint samples
11. Test resistance to Salt Spray of paint film
12. Test resistance to humidity of paint film
13. Prepare a surface for architectural paints application

Course Name : Diploma in Surface Coating Technology

Course Code : SC

Semester : Fourth

Subject Title : Allied Surface Coatings

Subject Code : 19424

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
03	--	03	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

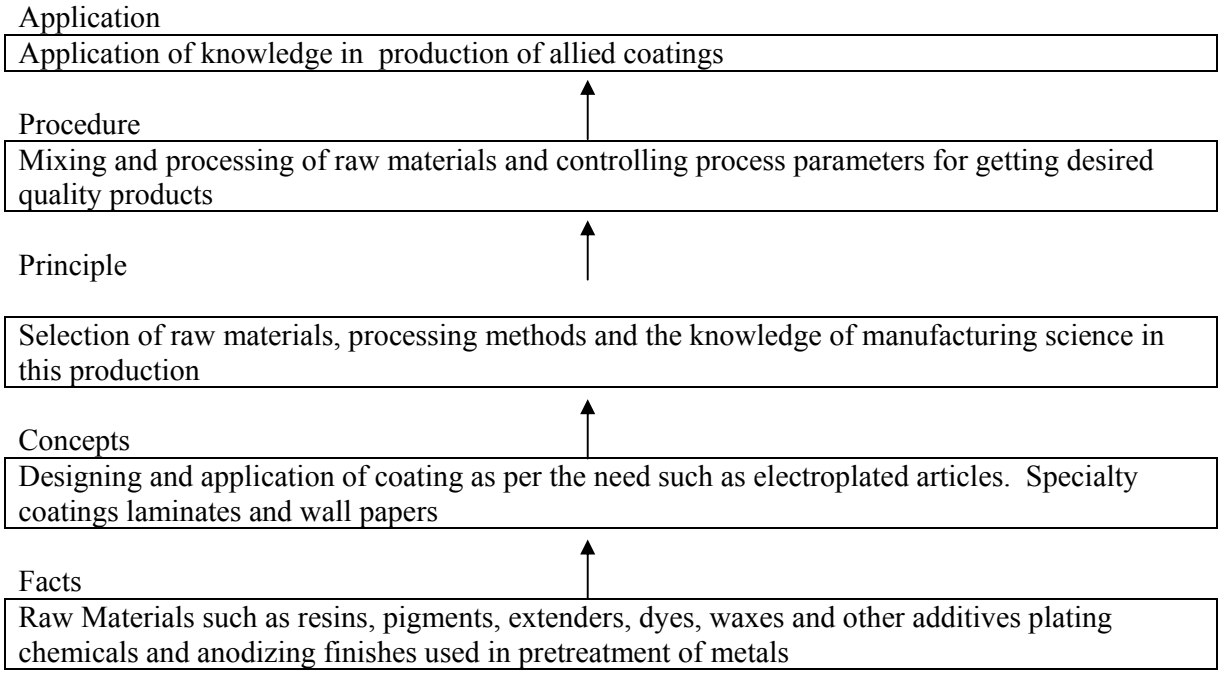
This subject includes technology and applications of allied surface coatings such as industrial polishes, polishing equipment, industrial and decorative laminates, cosmetics like nail paints, printing inks and plating finishes. This subject will provide knowledge of other type of surface coatings coming across in industrial life. This can also help young students develop a view to entrepreneurship

Objectives:

Student will be able to:

1. Identify type of allied coatings
2. Describe the expected properties and test methods of such coatings and processes
3. Identify application areas for such coatings in related fields.

Learning Structure:



Contents: Theory

Activities	Hours	Marks
Topic 1: Cosmetics **Specific Objectives:** ➢ State the general purpose of cosmetics & requirement of good cosmetics ➢ Describe the different types of waxes & explain their properties ➢ List the methods of applications of Industrial waxes **1.1 Skin Cosmetics** Marks : 10 composition, properties and uses of talcum powders, Lipsticks, vanishing and cold creams, Nail Polish **1.2 Industrial Polishes** Marks : 10 Wax polishes ,rubbing compounds, leveling compound, different types of buffing mops & tools	10	20
Topic 2: Printing Inks and Technology **Specific Objectives:** ➢ State & describe the difference between Inks & paints ➢ Explain the Printing processes such as offset, screen, flexo & gravure etc. ➢ Describe the advantages & limitations of Printing processes such as offset, screen, flexo & gravure etc. ➢ Explain special types of Inks & their application areas **2.1 Printing Inks** Marks : 08 Raw materials used & manufacturing methods: General methods used in manufacturing of inks & testing of Inks **2.2 Offset and screen printing:** Marks : 12 concept of viscosity in inks, test equipment, properties and uses of inks used in various technologies as offset, screen, flexo and gravure technology.	10	20
Special Purpose Inks: **Specific Objectives:** ➢ Describe the difference between ordinary Inks & special Inks ➢ Describe the application areas of special Inks ➢ State the requirement of Inks for plastic, electronics & packaging materials ➢ Describe the application process & testing of UV curable Inks **3.1 Special Purpose Inks :** Marks : 12 Ink jet Inks, anti-forgery inks, fluorescent inks, food wrapper inks, photo-copier Inks **3.2 UV Curable Inks & Coatings-** for plastics, packaging materials, wood, electronics Hardware Marks : 08	10	20
Electroplating & Waterproofing: **Specific Objectives:** ➢ Describe the principle of electrolysis & electrochemistry ➢ Explain the faradays law of electrolysis ➢ With neat diagram; Describe the vacuum metallizing process & name the application areas ➢ Identify the need & areas of waterproofing, describe the methods of waterproofing **4.1 Electroplating:** Marks: 12 Introduction to Electrochemistry, electrochemical & electrolytic cells,	10	20

Danielle cell as electrochemical cell, faradays laws of electrolysis. **4.2 Vacuum Metallizing** Marks : 04 Types of substrates, metallizing process, testing of coatings & application areas, evaluating Metallizing, foiling,		
FRP, Sealants & underbody coatings: **Specific Objectives:** ➢ Describe the advantages & limitations of FRP ➢ Explain the mold making process of FRP ➢ Describe the types of sealant, automotive undercoat used & state their merits & demerits Identify the need & areas of waterproofing, describe the methods of waterproofing **5.1 FRP** Marks : 08 Raw materials, mold design, mold making, composites, finishing **5.2 Sealants** Marks : 12 Requirement of sealants, types of sealants used, method of application, testing, underbody Coatings for automotive, their types & testing	08	20
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills :

1. Understand the requirements of Industrial coatings based on service conditions.
2. Prepare such type of surface coatings.
3. Apply such types of surface coatings.
4. Test & evaluate these surface coatings.

Psychomotor Skills :

1. Handle raw materials & testing instruments
2. Weigh, measuring and set up experimental set up
3. Dispose corrosive & hazardous chemicals

List of Experiments:(Minimum 10 experiments to be completed)

1. Prepare & test talcum powder
2. Prepare & test nail polishes.
3. Prepare & test vanishing cream
4. Determine the physical properties of Printing ink such as color, consistency, flow, length, tack, fineness of grind, texture etc.
5. Determine Specific Gravity & Bulk value of printing Ink using Coats micrometer Ink Pipette.
6. Find out viscosity of Printing Ink using falling bar Viscometer
7. Find out viscosity of Printing Ink using Brookfield Viscometer
8. Test water proofing paint for permeability of moisture
9. Carry out Pretreatments for Electroplating
10. Analyze content of electroplating bath solution
11. Conduct Copper electroplating & test the properties
12. Test sealants for NVM, Sp. Gravity, Viscosity & Inter coat adhesion
13. Report on visit to FRP/Automotive unit

Learning Resources :
Books:

Sr. No.	Author	Title of the Book	Publisher
1	Dr.J Stephan Jellinek	Formulations & functions of Cosmetics	John Wiley & Sons
2	W G Wood	Metals Hand Book Surface Cleaning Finishing & Coating. Vol. VI	American Society for Metals Park, Ohio
3	R H Leach & M J Mackenzie	Printing Ink Manual	Van Nostrand Rein Hold Com Ltd
4	E A Apps	Ink Technology for Printers & Students Part I-III	Leonard Hill Ltd.
5	Ronald E Todd	Printing Ink-Formulation Principles	Pira International
6	E A Apps	Printing Ink Technology	Leonard Hill Ltd.
7	R H Leach & M J Mackenzie	Printing Ink Manual	Van Nostrand Rein Hold Com Ltd

Course Name : Diploma in Surface Coating Technology

Course Code : SC

Semester : Fourth

Subject Title : Professional Practices-I

Subject Code : 19062

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER Hrs.	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

Most of the Surface Coating diploma holders join manufacturing / application industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

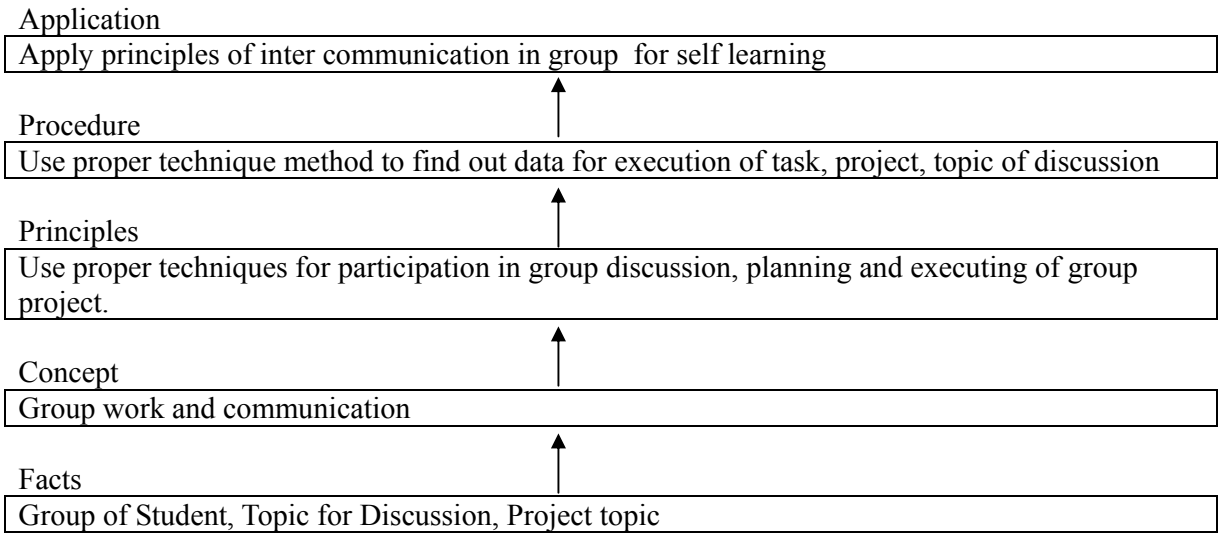
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topics.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Contents: Theory

Activities	Hrs
Topic 1: Industrial Visits: **Specific Objectives:** ➢ Define the purpose of Industrial visit ➢ Identify/state the relevant testing methods used in the industries ➢ Describe the use of suitable raw materials used for manufacturing of paints ➢ Explain the manufacturing process of pain/coating industry ➢ Operate the testing instruments Structured industrial visits to be arranged and report of the same shall be submitted by the individual student, to form a part of team work. (2 visits) Following are the suggested types of industry fields – i) Paint manufacturing unit to observe quality control ii) Printing ink manufacturing unit to observe mixing and dispersion iii) Pigment manufacturing unit to observe quality control iv) Resin manufacturing industry to observe manufacturing process v) Petroleum industry to observe distillation process vi) Paint India Exhibition (Alternate year) vii) Safety museum at Central Labor Institutes, Sion, Mumbai	08
Topic 2: The Guest Lecture /s : **Specific Objectives:** ➢ Define the objective of guest lecture ➢ Describe the process of operation ➢ Rewrite the material, machine & instrument required for the process explained ➢ Explain the application area of the process explained by the guest faculty ➢ Compile the advantage & limitation of the process / topic explained by the visiting faculty From field / industry experts , professionals to be arranged (2 Hrs. Duration) minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Tem Work a) Vacuum impregnation plant b) Wire enameling plant c) Construction Chemicals d) Environmental pollution and control e) Handmade paper manufacturing unit f) Formulating principles of paints g) Paint manufacturing machinery h) Advanced paint dispersion machines	08
Topic 3: Group Discussion : **Specific Objectives:** ➢ Define the objective group discussion ➢ Identify the team discussion of topic ➢ Explain the topic/view by giving suitable examples ➢ Summarize the topic at the end, to reach final conclusion of the discussion topic The students should discuss in group of six to eight students and write a brief report on the same, as a part of team work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one) Paint V/s Powder Coating, Epoxy V/s Polyurethane Solvents V/s Plasticizer Water borne V/s Solvent borne coatings Soaps V/s driers	08
Topic 4: Seminar (any 1 topics) **Specific Objectives:** ➢ Identify the topic of seminar topic	04

➢ Search the information available through print & electronic media ➢ Rewrite the topic in the form of review ➢ Prepare the power point presentation on the topic ➢ Produce the presentation before faculty & students Seminar topic should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time : 10 minutes for a group of 2 students)	
Topic 5: Mini Projects : (in a group of 6 – 8 students) **Specific Objectives:** ➢ Identify the topic of project in consultation with guide ➢ Search the information available through print & electronic media ➢ Prepare the project execution plan ➢ Show the time to time result to the guide. ➢ Modify the plan as per suggestions of the teacher ➢ Prepare the final report on the project carried out 1) Design / drawing of paint manufacturing unit 2) Design/ drawing of Ink manufacturing Plant layout 3) Design / drawing of Electroplating shop 4) Design / drawing of paint shop 5) Design / drawing of powder coating shop 6) Thermocouple base temperature controller 7) Models of valves 8) Models of material handling systems OR Modular courses on any one of the suggested or alike relevant topic be undertaken by a group of students (Min. 10) a) JIT - Just In Time Technique b) Non traditional manufacturing methods c) 3 D Modeling d) Piping Technology	20
Total	**48**

Learning Resources :
Books:

Sr. No.	Author / Editor	Title	Publisher
01	Mark Ratner and Daniel Ratner	Nanotechnology	Person Education , New Delhi
02	Yoram Korem	Computer control of Manufacturing System	McGraw Hill Publication
03	Sunil Chopra , Peter Meindl	Supply chain management	Person Education , New Delhi
04	Dilip Raghavan, Editor	Paint India	Colour Publications Pvt. Ltd, Mumbai
05	Dilip Raghavan , Editor	Colourage	Colour Publications Pvt. Ltd, Mumbai
06	Tim Wright, Editor	Coating World	A Rodman Publications, New jersy.
07	Dirk Meine	European coating Journal	--