CVM UNIVERSITY

(Established under Gujarat Private Universities
(Second Amendment) Act : 2019 Gujarat Act No. 20 of 2019)

FACULTY OF SCIENCE

Courses of Study

Master of Science

(Surface Coating Technology)

Effective from June 2020

STRUCTURE FOR M.Sc. SURFACE COATING TECHNOLOGY

Semester I (Total 650 marks)

Course Type	*Course No*	*Course Title*	*Theory / Practical*	*Credit*	*Contact Hrs/ week*	*Exam Duration in Hrs*	*Component of Marks*		
							Internal	*External*	*Total*
							Total / Passing	*Total / Passing*	*Total / Passing*
Core Subjects	101470101	Chemistry & Technology of Polymer Science	***Theory***	4	4	3	30/12	70/28	100/40
	101470102	Chemistry & Technology of Inorganic Pigments	***Theory***	4	4	3	30/12	70/28	100/40
	101470103	Surface Chemistry & Surface Engineering	***Theory***	4	4	3	30/12	70/28	100/40
	101470104	Practical: Analysis of Pigments, Oils & Resins	***Practical***	4	6	3	30/12	70/28	100/40
	101470105	Practical: Analysis of Architectural coatings	***Practical***	4	6	3	30/12	70/28	100/40
	101470106	Viva-Voce		1				50/20	50/20
Elective Subjects (Any One)	101470107	Process Control & Instrumental Analysis	***Theory***	4	4	3	30/12	70/28	100/40
	101470108	Fundamental Mechanical Engineering for Coating Technologist	***Theory***	4	4	3	30/12	70/28	100/40

STRUCTURE FOR M.S SURFACE COATING TECHNOLOGY
Semester II (Total 650 marks)

Course Type	***Course No***	***Course Title***	***Theory / Practical***	***Credit***	***Contact Hrs/ week***	***Exam Duration in Hrs***	***Component of Marks***		
							Internal	***External***	***Total***
							Total / Passing	***Total / Passing***	***Total / Passing***
Core Subjects	101470201	Technology of Resins for Surface Coatings – I	***Theory***	4	4	3	30/12	70/28	100/40
	101470202	Chemistry & Technology of Organic Pigments, High Performance pigments, Additives & Solvents	***Theory***	4	4	3	30/12	70/28	100/40
	101470203	Coating Properties & Analysis of Coating	***Theory***	4	4	3	30/12	70/28	100/40
	101470204	Practical: Instrumental Analysis and Analysis of Additives, Solvents & Raw material for resin	***Practical***	4	6	3	30/12	70/28	100/40
	101470205	Practical: Analysis of Industrial Coatings & Inks	***Practical***	4	6	3	30/12	70/28	100/40
	101470206	Viva-Voce		1				50/20	50/20
Elective Subjects (Any One)	101470207	Chemical Engineering Operations	***Theory***	4	4	3	30/12	70/28	100/40
	101470208	Economics & Industrial Management	***Theory***	4	4	3	30/12	70/28	100/40

STRUCTURE FOR M.SC SURFACE COATING TECHNOLOGY

Semester III (Total 650 marks)

Course . Type	***Course No***	***Course Title***	***Theory / Practical***	***Credit***	***Contact Hrs/ week***	***Exam Duration in Hrs***	***Component of Marks***		
							Internal	***External***	***Total***
							Total / Passing	***Total / Passing***	***Total / Passing***
Core Subjects	101470301	Technology of Resins for Surface Coatings – II	***Theory***	4	4	3	30/12	70/28	100/40
	101470302	Technology of Paint manufacturing	***Theory***	4	4	3	30/12	70/28	100/40
	101470303	Technology of Architectural Coatings and Industrial Coatings	***Theory***	4	4	3	30/12	70/28	100/40
	101470304	Practical – Processing of Surface Coatings I	***Practical***	4	6	6	30/12	70/28	100/40
	101470305	Practical – Processing of Surface Coatings II	***Practical***	4	6	6	30/12	70/28	100/40
	101470306	Viva-Voce		1				50/20	50/20
Elective Subjects (Any One)	101470307	Chemical Reaction Engineering	***Theory***	4	4	3	30/12	70/28	100/40
	101470308	Technology of Packaging and Printing Inks	***Theory***	4	4	3	30/12	70/28	100/40

STRUCTURE FOR M.SC SURFACE COATING TECHNOLOGY
Semester IV (Total 650 marks)

Course Type	*Course No*	*Course Title*	*Theory / Practical*	*Credit*	*Contact Hrs/ week*	*Exam Duration in Hrs*	*Component of Marks*		
							Internal	*External*	*Total*
							Total / Passing	*Total / Passing*	*Total / Passing*
Core Subjects	101470401	Coating Application & Specialty coatings	***Theory***	4	4	3	30/12	70/28	100/40
	101470402	Corrosion Technology & Heavy Duty Protective Coatings	***Theory***	4	4	3	30/12	70/28	100/40
	101470403	Technology of Construction Chemicals	***Theory***	4	4	3	30/12	70/28	100/40
	101470404	Practical: A project report based on literature survey and laboratory work conducted on topics related to Surface Coating Technology and/or chemistry is to be submitted and presented as a seminar by each student	***Practical***	8	12	3	60/24	140/56	200/80
	101470405	Viva-Voce		1				50/20	50/20
Elective Subjects (Any One)	101470406	Marketing Management	***Theory***	4	4	3	30/12	70/28	100/40
	101470407	Environmental Management	***Theory***	4	4	3	30/12	70/28	100/40

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470101		**Total Credit: 4**
Title Of Paper: Chemistry & Technology Polymer Science		
Unit	**Description in detail**	**Weightage (%)**
I	Historical developments in Polymeric materials; Concept of Monomer, Oligomer & Polymer (Homopolymers & Colopymers); Classification of Polymer; Types of Polymerization - Addition & Condensation polymerization, Techniques of polymerization – Bulk, Solution, Suspension & Emulsion; Kinetics of Polymerization	15 %
II	Functionality concept; Concept of Molecular weight of polymer, Determination of molecular weight. Characterization of polymers by Advanced Instrumental Techniques viz. TGA, DSC, FTIR etc.	25 %
III	Chain Topology; Glass Transition Temperature; Physical, chemical, thermal, mechanical and electrical properties of polymers; Structure property relationship in polymers; Crystallinity; Concept of Cross Linking & Cross Link Density, its effect on polymer properties	25 %
IV	Solubility criteria for the polymers, Solubility parameter, Solution properties, thermodynamics of polymer solutions, Phase separation in polymer solutions, Rheology of polymers; Degradation of Polymers	35 %

Basic Text & Reference Books:-

- Bailey's Industrial Oils and Fat products Vol I to Vol V, Hui Y.H., 5th ed; John Wiley and Sons, NY., 1996
- WM Morgan, "Outlines of Paint Technology.", 3rd ed, CBS Publishers & Distributors, 1996
- Surface Coatings – Raw Materials & Their Usage, OCCA-VOI I "Chapman and Hall", NY, 1993
- Introduction to Drying oil Technology by AR Mills.
- Oldring PKT "Resins for surface coatings - VOI I", 2nd ed., 1995
- Principles of Polymer science, by Bahadur and Sastry, Narosa Publishing House 2002.
- Polymer Science by Gowarikar, John Wiley and Sons, 1st ed., 1991
- Encyclopedia of polymer Science and Engineering, 2nd ed., John Wiley and Sons , Inc
- Polymer Chemistry by Malcolm P. Stevens, Oxford University Press Inc, 1990.
- Text book of Polymer Science, Billmeyer, John Wiley and Sons, .3rd ed.
- Principles of Polymer Systems, Rodriguez, Hemisphere Publishing Corpn, 1982.
- Introduction to Polymer Science and Technology, H.S. Kaufman and J.J. Falcetta, Willey – Interscience Publication, 1977
- Polymer Science and Technology of Plastics and Rubbers, 1st ed., P.Ghosh, Tata McGraw – Hill Publishing Company 1990.
- Text book of polymer Science, P. Nayak and S.Lenka, Kalyani Publishers, 1986.
- Fundamentals of polymer science an introductory text, P.Painter and M. Colman, Technomic publishing Co Inc, 1994.
- Paint technology Manual, Part 2, 2nd ed., OCCA, "Chapman and Hall", NY 1969.
- Polymer chemistry, Seymour and Carraher, Marcel Dekker,2003.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470102		**Total Credit: 4**
Title Of Paper: Chemistry & Technology Of Inorganic Pigments		
Unit	**Description in detail**	**Weightage (%)**
I	Theory of Color; Important Physico-Chemical Characteristics of Pigments, Analysis & testing of pigments	20 %
II	Classification of Inorganic Pigments; Chemistry, Properties and Applications of White pigments like Titanium Dioxide, Zinc Oxide etc.; Chemistry & technology of Fillers	30 %
III	Technology of Carbon Black Pigment; Manufacture, Properties and Applications of Metallic Pigments, Metal Oxide Pigments, Iron Blue Pigments, Ultra marine Blue & Chromium Pigments	30 %
IV	Manufacture, Properties & Application of anticorrosive pigments.	20 %

Basic Text & Reference Books:-

- HF Payne VOI II, Organic Coating Technology, 3rd ed John Wiley & Sons Ltd, 1967
- WM Morgan, “Outlines of Paint Technology.”, 3rd ed, CBS Publishers & Distributors, 1996
- Surface Coatings – Raw Materials & Their Usage, OCCA-VOI I “Chapman and Hall”, NY, 1993.
- T.C. Patton, Pigment Handbook, 3 VoIs, Wiley-Interscience, New York, 1973.
- P.A. Lewis, Pigment Handbook, 3 Vols, Wiley-Interscience, New York, 1985.
- Industrial Inorganic Pigments, BuxBaun, 3rd ed., 2005, Wiley – VCH Verlag
- Metallic Pigments in Polymer, 1st ed., Ian Wheeler, Rapra Tech. Ltd., 1999
- Solomon ‘Chemistry of Pigments & Fillers.’, 1st ed., John Wiley & Sons., 1983
- Swaraj Paul, ‘Surface coating’, 2nd ed., John Wiley & Sons Ltd, 1996.
- Z.W.Wicks, Jones, Pappas; “Organic Coatings” Sci. & Tech, VOI I John Wiley and Sons, Inc., NY 1992.
- Pigments: An introduction to physical Properties, David Patterson
- Basics of Paint Technology, Vol I, V.C. Malshe, 1st ed. 2000

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470103		**Total Credit: 4**
Title Of Paper: Surface Chemistry & Surface Engineering		
Unit	**Description in detail**	**Weightage (%)**
I	Surface Chemistry: Application of surface chemistry, Interfacial tension, Free energy changes, wetting & emulsification	25 %
II	Chemistry & Technology of Surfactants.	25 %
III	Surface Engineering: Introduction; Electroplating; Thermal Spray Coating; Cold Gas Dynamic Coating; Diffusion Coating; CVD & PVD; Plasma Immersion Ion implantation; DLC thin film; Sol Gel Coating; Laser Assisted Surface Engineering; Micro Arc Oxidation; Electro Spark Coating etc.	50 %

Basic Text & Reference Books:-

- Surfactants and Interfacial Phenomena, Milten, J. Rosen, Wiley Inter science Publication, New York.
- “Paint flow and pigment dispersion”, 2nd ed., T.C.Patton, 1979.
- Fats,oleochemicals and surfactants : Challenges in the 21st century, Mani,V.V.S and Shitole
- Chemistry and Technology of Surfactants, Richard J. Farn, Blackwell Publishing Ltd
- Surface Engineering: ASM Handbook Volume 5, ASM International

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470104		**Total Credit: 4**
Title Of Paper: Practical : Analysis of Pigments, Oils & Resins		
Unit	**Description in detail**	**Weightage (%)**
	Qualitative & quantitative analysis of different organic & inorganic Pigments, Vegetable oils, Natural & Synthetic resins.	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470105		**Total Credit: 4**
Title Of Paper: Practical : Analysis of Architectural Coatings		
Unit	**Description in detail**	**Weightage (%)**
	Qualitative & quantitative analysis of various architectural coatings like different varnishes, Solvent based architectural paints, Primers, Putty, Water based paints etc. Demonstration Practical: Mechanical Engineering Operations	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470106		**Total Credit: 1**
Title Of Paper: Comprehensive Viva		
Unit	**Description in detail**	**Weightage (%)**
	Oral Questions on All Subject of 1st Semester M.Sc (SCT)	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470107		**Total Credit: 4**
Title Of Paper: Process Control & Instrumental Analysis		
Unit	**Description in detail**	**Weightage (%)**
I	Laplace transform, Response of first order system, First order in series, second order system. Time constants of measuring elements, modes of control action, selection of control modes, feed back systems component, Negative and Positive feed back systems, response time, Rise time, over shoot, decay ratio, transducers, Pneumatic and electronic controllers baffle nozzle mechanism for P, PI and PID systems.	50 %
II	Instrumental Analysis, Sample conditioning for process analyzers, Application of on line analyzers in paint industries, IR process analyzers, UV/VIS absorption analyzers. Process gas and process liquid chromatography, HPLC, GC, TLC, Column, Paper. Use of ion-exchange resin in chemical analysis.	50 %

Basic Text & Reference Books:-

- Process systems Analysis and control, by D.R. Coughanour; 2nd ed Mc Graw Hill international Edition.
- Chemical Process Control, An Introduction to Theory and Practice by G Stephanopoulas, Prentice Hall of India Private Ltd, New Delhi.
- Instrumental Methods of Chemical Analysis, by B.K. Sharma, 2nd Edition, GOEL Publishing House , Meerut
- Spectroscopy of organic compounds, by P.S. Kalsi, 5th Ed. New Age International Publishers.
- Analytical Chemistry by D. Kealy and P.J. Haines, Viva Books Pvt. Ltd., New Delhi.
- Organic Spectroscopy by W. Kemp.3rd Ed. ELBS with Mac Millan

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: I
Syllabus with Effect from: June - 2020

Paper Code: 101470108		**Total Credit: 4**
Title Of Paper: Fundamental Mechanical Engineering for Coating Technologist		
Unit	**Description in detail**	**Weightage (%)**
I	Introduction; Engineering Materials & Their Properties; Elements of power transmission, Couplings & Seals; Metal Cutting Machines; Sheet Metal Operations; Welding & Casting; Abrasive Machining Process; Hydraulic & Pneumatic systems; Nozzles & Spray Guns; Spraying Systems; Robotics; Forging & Rolling	100 %

Basic Text & Reference Books:-

- Basic Mechanical Engineering, by R B Arora & B K Raghunath, Atul Prakashan
- Robotics: Principal & Practice, Dr K.C. Jain, Dr. L.N. Aggarwal, Khanna Publications
- Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, PHI Pvt. Ltd.
- Introduction to Hydraulics (3rd ed), John Pippenger, Tyler Hicks, Mc-Graw Hill Book Co.,
- Oil Hydraulic Systems: Principles & maintenance, Majumdar S.R.
- Hydraulics & Pneumatics: A Technician's & Engineers' guide, Andrew Parr, Jaico Publishing House

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470201		**Total Credit: 4**
Title Of Paper: Technology of Resins for Surface Coating - I		
Unit	**Description in detail**	**Weightage (%)**
I	Chemistry and Technology of Synthetic resins viz. Alkyds, Polyester, Phenolic, Amino, Acrylic & Vinyl resins: Raw materials for these resins, Chemistry of synthesis of these resins, processing techniques, properties & applications of these resins for surface coatings.	90 %
II	Chemistry and Technology of Oils and Natural resins like rosin, shellac, Bitumen, Asphalts and Coal tar – Their modifications & uses	10 %

Basic Text & Reference Books:-

- Surface Coatings – Raw Materials & Their Usage, OCCA-VOl I "Chapman and Hall", NY, 1993.
- Resins for surface coatings, Vol I, II & III, P.K.T. Oldring, SITA Technology
- Resins for coating: Chemistry, Properties and Applications, 1st ed, Stoye D, Hanser Publishers, 1996
- "Organic coatings, Science & Technology" Vol I, Wicks, Wiley Interscience Pub. Ltd, 1992
- The Chemistry of Organic Film Formers, Soloman, D.F. Wiley, New York.
- Swaraj Paul, 'Surface coating', 2nd ed., John Wiley & Sons Ltd, 1996.
- Surface coatings Vol 1 to 3 WILSON, 1st ed, Elsevier Applied Science, 1986
- The Technology of Paints, Varnishes & Lacquers, 1st ed., C.R. Martens, Roberts E Kniger Pub. Co-Oprat, 1974
- High solids Alkyd Resins, Holmberg Krister, Marcel Dekker, 1987
- CNSL Patents, Cashew promotion council, Ernakulam
- WM Morgan, "Outlines of Paint Technology.", 3rd ed, CBS Publishers & Distributors, 1996
- Alkyd Resin Technology, T.C. Patton
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999
- Water borne and Solvent based Coatings, Resins & Their Applications – Vol 1, OLDRING, 1996.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470202		**Total Credit: 4**
Title Of Paper: Chemistry & Technology of Organic Pigments, High Performance Pigments, Additives & Solvents		
Unit	**Description in detail**	**Weightage (%)**
I	Concept of Dyes & Pigments; Lakes, Tonner, Resinated pigments, Flushed Colors, Dispersed Colors; Chemistry and Technology of Organic Pigments: Azo Pigments, Benzimidazolone dioxazines, Naphthol AS Pigments, perylenes, Phthalocyanines, Quinacridones etc.	25 %
II	Technology & Applications of High Performance Pigments & Special Effect Pigments	25 %
III	Types, preparation, and applications of Metallic Driers; Additives used in aqueous and non-aqueous paint systems for wetting and dispersion, Storage stability and application properties	40 %
IV	Solvents: Classification of Solvents, their characteristics, uses and application.	5 %
V	Plasticizers: Classification, Characterization, Theory and application	5 %

Basic Text & Reference Books:-

- HF Payne VOI II, Organic Coating Technology, 3rd ed John Wiley & Sons Ltd, 1967
- WM Morgan, “Outlines of Paint Technology.”, 3rd ed, CBS Publishers & Distributors, 1996
- Surface Coatings – Raw Materials & Their Usage, OCCA-VOI I “Chapman and Hall”, NY, 1993.
- T.C. Patton, Pigment Handbook, 3 VoIs, Wiley-Interscience, New York, 1973.
- P.A. Lewis, Pigment Handbook, 3 Vols, Wiley-Interscience, New York, 1985.
- Herbst; ‘Industrial Organic Pigments, Production, Properties and Application’, 3rd ed., Wiley – VCH Verlag, 2004
- Swaraj Paul, ‘Surface coating’, 2nd ed., John Wiley & Sons Ltd, 1996.
- “High Performance Pigments”, Smith, Wiley – VCH Verlag, 2002
- Stoye : Paints, Coatings and Solvents, 1st ed., Wiley – VCH, 1993
- Handbook of Coating Additives, J. Calbo, 1st ed., Vol I & II, Marcel Dekker, 1992
- Paint Additives: Recent development, G.B.Rothenberg
- Additives for waterborne coatings, D.R. Karsa
- Z.W.Wicks, Jones, Pappas; “Organic Coatings” Sci. & Tech, VOI I John Wiley and Sons, Inc., NY 1992.
- Solvents; Durrans, Thos H.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470203		**Total Credit: 4**
Title Of Paper: Coating Properties & Analysis of Coating		
Unit	**Description in detail**	**Weightage (%)**
I	Study of important characteristics of surface coating viz. Rheological properties, Optical Properties, Adhesion and Mechanical properties, Corrosion and Chemical resisting properties, Film thickness, Liquid Paint analysis according to ASTM, BIS and BS Standards, Characterization of Varnishes according to ASTM, BIS and BSS Standards.	70 %
II	Durability of coatings- Natural and Accelerated methods.	10 %
III	Surface Coating defects: Defects in liquid paints, during application and cure and in dry film exposure.	20 %

Basic Text & Reference Books:-

- Organic Coatings: Properties and Evaluation, Kronstandt.
- Organic Coatings - Applications, Properties & Performance, Vol II, Wicks Z. W., Wiley Interscience Pub.ltd., 1992
- Hess's Paint film defects, 3rd ed, Hamburg,H & Morgans,W.M.
- Protective Paint coatings for metals, Fraunhofer and Boxall, Particullis Press Ltd, 2 Queensway, Surey, England.
- Surface coatings: Vol II: Paints & Their Applications, 2nd ed., OCCA, Chapman and Hall, 1984.
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999.
- WM Morgan, "Outlines of Paint Technology.", 3rd ed, CBS Publishers & Distributors, 1996
- Adhesion of coatings: Theory and Practice, PROSSER
- Paint Testing Manual, 14th ed., Gardner Sward

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470204		**Total Credit: 4**
Title Of Paper: Instrumental Analysis & Analysis Of Additives, Solvents & Raw Material For Resin		
Unit	**Description in detail**	**Weightage (%)**
	Instrumental analysis of various paint raw materials; Quantitative & Qualitative analysis of additives for surface coatings, various solvents and selected raw materials for different synthetic resins.	100%

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470205		**Total Credit: 4**
Title Of Paper: Practical : Analysis Of Industrial Coatings & Inks		
Unit	**Description in detail**	**Weightage (%)**
	Qualitative & quantitative analysis of various Industrial coatings like Epoxy coatings, Polyurethane coatings, Zinc rich coatings, Chlorinated rubber coatings etc. Qualitative & quantitative analysis of various inks like screen printing ink, lithographic ink, Flexographic inks etc.	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470206		**Total Credit: 1**
Title Of Paper: Comprehensive Viva		
Unit	**Description in detail**	**Weightage (%)**
	Oral Question on all Subject of 2nd Semester M.Sc (SCT)	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470207		**Total Credit: 4**
Title Of Paper: Chemical Engineering Operations		
Unit	**Description in detail**	**Weightage (%)**
I	Concept of Unit Operations; Types of Pumps, Principles of Operation of Pumps; Vacuum producing devices; Compressors; Blowers; Size reduction – crushing and grinding; Filtration; Drying; Distillation; Mixing; Heat exchangers, Principles of heat transfer, types of heat transfer, different types of heating media.	100 %

Basic Text & Reference Books:-

- Introduction to Chemical Engg., 1st ed., By Walter L. Badger and Julius T Bancharo, Mc.Graw Hill Book Co.
- Unit Operation of Chemical Engg., 4th ed.; By Warren L Macabe and Julian C Smith , Mc. Graw Hill Book Co.
- Unit Operation (Vol I to VI), 1st ed., by JH Coulson and JF Richardson, Pergamon Press
- Mass Transfer Operations, Robert E Treybal , Mc. Graw Hill Book Co.
- Hand Book of Chemical Engg by JH Perry, 7/e, Mc. Graw Hill Book Co.
- Fundamentals of Engg. Heat and Mass Transfer by R.C. Sacheiva, Wiley Eastern Ltd.
- Process Heat Transfer by Kern , Mc. Graw Hill Book Co.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: II
Syllabus with Effect from: June - 2020

Paper Code: 101470208		**Total Credit: 4**
Title Of the Paper: Economics & Industrial Management		
Unit	**Description in detail**	**Weight age (%)**
I	Economics: Basic Economics Concept, Demand and Supply, Elasticity of Demand and Supply, Concept of Profit and Revenue, Concept of Equilibrium and Margin, Introduction to Micro and Macro Economics and Price theory. Commercial and Central banking; Analysis and interpretation of standard financial statements;	30 %
II	Industrial Management: Management: Concept, Nature, Functions: Planning, Organizing, Directing, Control, Decision Making	20 %
III	Business: Concept & Objectives, Forms of Business Organization	10 %
IV	Human Resource Management: Concept – Functions- Recruitment and Selection, Training and Development, remuneration and incentive schemes Inventory Management: Meaning, Importance, Techniques	20 %
V	Quality Control: Meaning, Importance, TQM.	10 %
VI	Standardization: Concept of International standardization, Need of standardization, Understanding of Important standardizations.	10 %

Basic Text & Reference Books:-

- Fundamentals of Business Organization & Management by: Y.K. Bhushan.
- Projects: Planning, Analysis Selection, Implementation & Review by :Prasannanchendun.
- Industrial Engineering & Management by: O.P.Khanna.
- Personnel Management: C.B. Mamorian.
- Best Practice in Inventory Management, by Tony Wild, Elsevier Science
- Essentials of Inventory Management, by Max Muller, AMACOM
- Total Quality Management – An Introductory Text by Paul James, Prentice Hall
- Quality Control and Applications by Housen & Ghose

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470301		**Total Credit: 4**
Title Of Paper: Technology of Resins for Surface Coating - II		
Unit	**Description in detail**	**Weightage (%)**
I	Chemistry and Technology of Synthetic resins viz. Polyamides, Epoxy, Polyurethanes, Silicone resin, Chlorinated Rubber: Raw materials for these resins, Chemistry of synthesis of these resins, processing techniques, properties & applications of these resins for surface coatings.	90 %
II	Chemistry and Technology of Cellulosic film formers e.g. Nitrocellulose and CAB.	10 %

Basic Text & Reference Books:-

- Surface Coatings – Raw Materials & Their Usage, OCCA-VOl I "Chapman and Hall", NY, 1993.
- Resins for surface coatings, Vol I, II & III, P.K.T. Oldring, SITA Technology
- Resins for coating: Chemistry, Properties and Applications, 1st ed, Stoye D, Hanser Publishers, 1996
- "Organic coatings, Science & Technology" Vol I, Wicks, Wiley Interscience Pub. Ltd, 1992
- The Chemistry of Organic Film Formers, Soloman, D.F. Wiley, New York.
- Swaraj Paul, 'Surface coating', 2nd ed., John Wiley & Sons Ltd, 1996.
- Surface coatings Vol 1 to 3 WILSON, 1st ed, Elsevier Applied Science, 1986
- The Technology of Paints, Varnishes & Lacquers, 1st ed., C.R. Martens, Roberts E Kniger Pub. Co-Oprat, 1974
- High solids Alkyd Resins, Holmberg Krister, Marcel Dekker, 1987
- CNSL Patents, Cashew promotion council, Ernakulam
- WM Morgan, "Outlines of Paint Technology.", 3rd ed, CBS Publishers & Distributors, 1996
- Alkyd Resin Technology, T.C. Patton
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999
- Water borne and Solvent based Coatings, Resins & Their Applications – Vol 1, OLDRING, 1996.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470302		**Total Credit: 4**
Title Of Paper: Technology of Paint Manufacturing		
Unit	**Description in detail**	**Weightage (%)**
I	Principles of Paint Formulation, Rheology of mill base consistency by Daniel flow point and f (PVC); Concept of Pigment Volume concentration (PVC) and CPVC, RTM & MBC	30 %
II	Theory of pigment Wetting and dispersion; Dispersion technology, Coating manufacturing equipments - Machinery used for grinding of minerals and Pigments for paints including Balls Mill, Sand Mill, Dyano Mill, Attritor, Basket Mill, HSDD, TSD, TRM etc.	50 %
III	Plant Location & Paint Factory Layout; Important concepts of production management	10 %
IV	Pollution & its control in paint industry; Safety & Hygiene in Paint Industry	10 %

Basic Text & Reference Books:-

- Surface coatings: Vol II: Paints & Their Applications, 2nd ed., OCCA, Chapman and Hall, 1984
- "Paint flow and pigment dispersion", 2nd ed., T.C.Patton, 1979
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999
- Basics of Paint Technology, Vol I, V.C. Malshe, 1st ed. 2000
- Basics of Paint Technology, Vol II, V.C. Malshe, 1st ed. 2008
- Organic Coatings - Applications, Properties & Performance, Vol II, Wicks Z. W., wiley interscience pub.ltd., 1992
- Paint Formulations: Principles & Practice; J. Boxal & Fraunhoffer
- Concise Paint Technology, J. Boxal & Fraunhoffer, 1st ed., Chem Pub., 1979
- "Introduction to Paint Chemistry & Principle of Paint Technology", 3rd ed., Turner G.P, Chapman & Hall, 1988

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470303		**Total Credit: 4**
Title Of Paper: Technology of Architectural Coating and Industrial Coatings		
Unit	**Description in detail**	**Weightage (%)**
I	Classification of coatings; Mechanisms of film formation in surface coatings	10 %
II	Technology of solvent based architectural & industrial coatings	20 %
III	Technology of Water based Paints & coatings: Cement Paints, Chemistry and technology of emulsion and latex paints, Preparation of latex, Emulsion Polymerization Plant and Design; Developments in waterborne coatings	30 %
IV	Technology of Varnishes & lacquers	10 %
V	Specific application Paints and Coatings: Wood Finishes, Road Marking Paint, Automotive coatings and refinishes, Novelty Finishes	20 %
VI	Recent trends in Coating Industry	10 %

Basic Text & Reference Books:-

- The Technology of Paints, Varnishes & Lacquers, 1st ed., C.R. Martens, Roberts E Kniger Pub. Co-Oprat, 1974.
- Surface Coatings – Raw Materials & Their Usage, OCCA-VOI I "Chapman and Hall", NY, 1993
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999.
- Water borne and Solvent based Coatings, Resins & Their Applications – Vol 1, OLDRING, 1996.
- Emulsion Polymers and Emulsion Polymerization, BASSETT.
- Waterborne Coatings: Emulsions And Water Soluble Paints. 'C.R. Martens'. Van Nostrand Reinhold Company, 1981
- WM Morgan, "Outlines of Paint Technology.", 3rd ed, CBS Publishers & Distributors, 1996.
- Principles of Emulsion Technology; Bacher & Paul
- "Organic Coating Technology - VOI II", HF Payne, 3rd ed John Wiley & Sons Ltd, 1967
- Protective & Decorative Coatings, Vol I, II & III, J.J. Mattiello
- Powder coatings: A Practical Guide to equipments, Process & Productivity at a profit, Vol II, Howell David M, John Willey, 2000.

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470304		**Total Credit: 4**
Title Of Paper: Practical - Processing of Surface Coatings - I		
Unit	**Description in detail**	**Weightage (%)**
	Synthesis & characterization of various surface coating resins like Hard resins, Alkyds, Varnishes, Polyesters, Epoxies, Polyamides, Acrylics, Amino resins, CNSL resin, emulsions & water reducible resins etc.	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470305		**Total Credit: 4**
Title Of Paper: Practical - Processing of Surface Coatings - II		
Unit	**Description in detail**	**Weightage (%)**
	Daniel flow point, Preparation of selected organic & inorganic pigments; Preparation of different architectural & industrial coatings like Enamels, Primers, Putties, Lacquers, Water based paints, Inks, HDPCs, Conversion coatings etc.	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470306		**Total Credit: 1**
Title Of Paper: Comprehensive Viva		
Unit	**Description in detail**	**Weightage (%)**
	Oral Question on all Subject of 3rd Semester M.Sc (SCT)	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470307		**Total Credit: 4**
Title Of Paper: Chemical Reaction Engineering		
Unit	**Description in detail**	**Weightage (%)**
I	Classification of Chemical Reactors; Design equations for isothermal and adiabatic operation; Multiple reactor system, Recycle reactors, constant volume and constant pressure reactors; Kinetics of reversible, complex (Parallel and Series) and Autocatalytic reactions; Kinetics of heterogeneous reactions – Global rate of reaction; Adsorption Langmuir and BET; Catalyst Promoters, Poisons and Inhibitors, Surface Reactions Unimolecular and Bimolecular; Introduction to Catalytic Reactors	100 %

Basic Text & Reference Books:-

- Chemical Reaction Engg. by Octave Levenspiel , 3rd Ed. John Wiley & Sons.
- Chemical Engg. Kinetics, by JM Smith, 3rd Ed. McGraw Hill Book Co.
- Fundamentals of Chemical Reactions Engg., 2nd Ed. by Holland and Anthony, Prentice-Hall International Edition.
- Chemical Reactor Theory, by Denbigh and Turner, University of Cambridge.
- Reaction Engg. through solved problem, by Srivastva and Pande, Metropolitan Book Co(P) Ltd, New Delhi
- Chemical Kinetics, by S.K. Jain, Vishal Publication , Jallandhar

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: III
Syllabus with Effect from: June - 2020

Paper Code: 101470308		**Total Credit: 4**
Title Of the Paper: Technology of Packaging and Printing Inks		
Unit	**Description in detail**	**Weight age (%)**
I	Difference between Paints and Inks- Formulation, manufacturing & Application basis. The different printing Processes like Gravure, Flexographic, Screen, Lithography, Letterpress, inkjet, Photostat copier - their merits and demerits.	35 %
II	Classification of Inks on the basis of Printing Processes. Their manufacturing techniques. Quality control of Inks. Methods of Ink Drying.	
III	Specialty Inks (Antiforgery/Security). Behavior of Inks on machines; Trouble shooting in various printing processes; Storage stability of Inks	25 %
IV	Elements of packaging, natural packaging, packaging values, Professional approach to develop package for food products, general consumables, cosmetics, pharmaceuticals, engineering materials and other utilities.	
V	Packaging materials and their forms. Paper and paper board, folded cartons and setup boxes, corrugated board, box construction, interior packing's, moulded forms, paper composites, tetra pack, wood containers, glassware's.	20 %
VI	Plastic as packaging material in different forms- flexible polymeric films, metallic foils, orientation and metallization. Metal containers- tin plate cans, tin free steel cans and tempers, coatings and linings, aluminum cans, collapsible tubes, fiber tubes, Aerosols-principle, valves. Coatings and lamination, paper films and foils for lamination, adhesives, labels and labeling, heat transfer labels, coding and holograms etc. Package printing importance, Package disposal, Eco-Friendly packing's, Innovations in packaging: Active packaging, anti microbial containers, RFID technologies.	20 %

Basic Text & Reference Books:-

- Printing Ink Manual; by R. H. Leach & R. J. Pierce
- Handbook on Printing Technology
- Modern Printing Technology
- Complete Book on Printing Technology
- Handbook of Package Engineering by Joseph F. Hanlon
- Edible Coatings & Soluble Packaging by Roger Daniels

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June – 2020

Paper Code: 101470401		**Total Credit: 4**
Title Of Paper: Coating Application & Specialty Coatings		
Unit	**Description in detail**	**Weightage (%)**
I	Techniques of Surface Preparation: Need for Surface Preparation; Manual and Mechanical methods of Surface Preparation, e.g. Sand blasting and Flame clearing; Conversion Coatings and Pretreatment Chemicals for Ferrous and Non-Ferrous Substrate; Surface Preparation for Plastic Substrates; Rust Converters	30 %
II	Techniques of Paint Application: Brushing, dipping, conventional spray, Air less spray, electrostatic spray, Bell applicator, electrodeposition coating, vacuum impregnation, Curtain coating and roller coatings	30 %
III	Study of Coil Coating, UV cured coating, Powder Coatings, Non Stick coatings, Smart Coatings, Hygienic Coatings	40 %

Basic Text & Reference Books:-

- Organic Coatings - Applications, Properties & Performance, Vol II, Wicks Z. W., wiley interscience pub.ltd., 1992.
- Protective Paint coatings for metals, Fraunhofer and Boxall, Particullis Press Ltd, 2 Queensway, Surey, England.
- Surface coatings: Vol II: Paints & Their Applications, 2nd ed., OCCA, Chapman and Hall, 1984.
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999.
- The Technology, Formulation & Application of Powder coatings Vol I, Howell David M, John Willey, 2000.
- Phosphating of Metals, RAUSH.
- Automotive Paints and Coatings, Hans-Joachim Streitberger & Karl-Friedrich Dossel, 2008
- Paint Technology Handbook, Rodger Talbert, 2007

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470402		**Total Credit: 4**
Title Of the Paper: Corrosion Technology & Heavy Duty Protective Coatings		
Unit	**Description in detail**	**Weight age (%)**
I	Corrosion Science, Engineering and Technology:- corrosion damage and cost of corrosion; functional and economic aspects of corrosion; classifications of corrosion processes; corrosion quantification and corrosion rate expressions; electrochemical aspects to affect corrosion rate - polarization and passivity; environmental factors to affect the corrosion rate.	15 %
II	Practical forms of corrosion (in practice) I. Uniform corrosion, II. Non-uniform/localized attack (i) Galvanic/Bimetallic (ii) Crevice & Filiform (iii) Pitting (iv) Inter granular corrosion (v) Selective leaching-dezincification & graphitization (vi) Erosion corrosion - impingement attack, cavitation damage, fretting corrosion (viii) Stress corrosion cracking & corrosion fatigue	25 %
III	III. Miscellaneous-Hydrogen damage, radiation damage, caustic embrittlement. (a) Corrosion under various conditions : atmospheric corrosion; underground corrosion- natural soil, stray current, biological corrosion; immersion corrosion; marine corrosion, liquid metal corrosion, aerospace, electronic equipments, dew point corrosion, high temperature corrosion. (b) Corrosion in industries: chemical industries- pulp & paper, fertilizer, paint manufacture & application industries; petroleum refineries and petrochemical industries; building industry and rebar corrosion; boiler plants; automobile industry; nuclear power plants. (c) Corrosion testing: Destructive and non-destructive methods; physico-chemical methods-immersion, humidity, salt spray; special property tests for SCC, IGC etc.; electrochemical methods-E-I curves/Evans diagrams/polarization diagrams; electrode potential measurements, impedance measurement, electronic instrumentations, NACE test methods; (d) Corrosion Inhibition	20 %
IV	Technology of Heavy Duty Protective Coatings:- Basic requirements of HDPC, Blasting, Coverage, Dry film Thickness, Chemical bondage criteria in 2K epoxy, Epoxy-Coal Tar, Epoxy Ester coatings, 2K Polyurethane Pigmented coatings, Tape Coatings, Chlorinated Rubber Paints, Zinc rich Coatings. HDPC for structures in corrosive environments. Technology of Marine Coatings:- Anticorrosive Primers, Zinc Chrome & Red Lead based Boot-Top Paints. Anti Fouling Paints- Soluble & Insoluble matrix, Self Polishing, Copper complex based.Paints for Super structures & Harbour Installation. Testing of Marine Paints as per IS: 1470, 1419.	40 %

Basic Text & Reference Books:-

- Surface coating Technology Vol II, OCCA, Chapman and Hall, London & New York.
- "Paints and surface coatings -Theory & Practice", 2nd ed., R. Lambourne & T.A. Stevens, William Andrew Publishing, 1999.
- Protective Coatings for Metals, E.J. Vaughan & J.W. Gailer
- Protective Paint coatings for metals, Fraunhofer and Boxall, Particullis Press Ltd, 2 Queensway, Surey, England.
- Organic Coatings, Science and Technology, vol 2, WICKS.
- Basics of Paint Technology, Vol I, 1st ed., V.C. Malshe, 2000
- Corrosion and corrosion protection handbook, by Philip A. Schweitzer (Ed.), Marcel Dekker c.
- Corrosion and corrosion control by H.H.Uhlig & R.V.Revie Wiley-Interscience

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470403		**Total Credit: 4**
Title Of Paper: Technology of Construction Chemicals		
Unit	**Description in detail**	**Weightage (%)**
I	Concrete Admixtures: Mineral and Chemical Admixtures Waterproofing materials in Construction Concrete Repair/ Grouts: Cementitious and Polymer modified Industrial Flooring: Floor Screeds & Toppings, Surface Treatments, ESD - Anti Static/ Dissipative/Conductive Floor Coatings, Road /Floor Marking Coatings Sealants: Polysulphides, Polyurethanes, Silicone Bonding agents: SBR, Acrylic Anchoring materials: Epoxy Other related materials such as curing agents, Mould release agents, surface retarders, expansive agents, etc	100 %

Basic Text & Reference Books:-

- Technology Of Building Materials And Chemicals With Processes (hand Book)
- Building Construction Materials and Techniques by P.Purushothama Raj
- Building Materials (Thirdrevisededition) S. K. Duggal
- Construction Chemicals Manufacturing Formulations Book (Grouts, Chaulks, Sealants, Putties & Adhesive) Paperback – 2016 by Dr.Javid Ahmad Dar. Ph.D

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470404		**Total Credit: 8**
Title Of Paper: Practical: Project		
Unit	**Description in detail**	**Weightage (%)**
	Practical: A project report based on literature survey and laboratory work conducted on topics related to Surface Coating Technology and/or chemistry is to be submitted and presented as a seminar by each student	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470405		**Total Credit: 1**
Title Of Paper: Comprehensive Viva		
Unit	**Description in detail**	**Weightage (%)**
	Oral Question on all Subject of 4th Semester M.Sc (SCT)	100 %

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470406		**Total Credit: 4**
Title Of Paper: Marketing Management		
Unit	**Description in detail**	**Weightage (%)**
I	Basic concepts of marketing, Product, Price, Promotion and Distribution Functions of Marketing Management Building customer satisfaction, strategic planning, marketing planning, MIS and marketing research, consumer behavior, marketing mix, business and competition analysis Brand Management, Sales Promotion and Public Relations Product Planning and Development, Product Life Cycle Performance Evaluation of Marketing Programmes, global marketing, Rural Marketing, Industrial Marketing Distributor Network: Importance & Management Export Management – Importance, Promotion, Procedure and Problems Demand forecasting: Long and short term demand forecasting methods. Regression Analysis and smoothing methods; Estimation of trend, cycle, seasonality components; Analysis of forecast error and computer control of forecasting systems	100 %

Basic Text & Reference Books:-

- Marketing Management by Philip Kotler.
- Industrial Engineering & Management by: O.P.Khanna.
- Marketing Management: Rajan Nair, J.C. Gandhi.
- Managerial Economics by Peterson & Lewis

CVM UNIVERSITY
Programme & Subject: M.Sc (Surface Coating Technology)
Semester: IV
Syllabus with Effect from: June - 2020

Paper Code: 101470407		**Total Credit: 4**
Title Of Paper: Environmental Management		
Unit	**Description in detail**	**Weightage (%)**
I	Concept of Green Chemistry & Technology Introduction to environmental Legislations pertaining to paint & coating industries Basic Environmental Chemistry Management of water pollution, air pollution & hazardous waste Advanced technologies for environmental management Cost benefit analysis of pollution abatement Energy Conservation & renewable resource of energies ISO standards for Environmental Management Concept of Carbon Credit and Life Cycle Assessment. Environment, Health and Safety (EHS): SDS, H-Phrase, GHS Labeling	100 %

Basic Text & Reference Books:-

- Green Chemistry: Theory and Practice, Paul T. Anastas and John C. Warner. New York: Press, 1998.
- Wastewater Engineering: Treatment, Disposal, Reuse by Metcalf & Eddy, Tata McGraw, New Delhi
- Basic Environmental Engineering , by R C Gaur
- Environmental Engineering, 6th ed, Nelson L. Nemerow (Editor), Franklin J. Agardy (Editor), Joseph A. Salvato (Editor) by John Wiley & Sons, Inc.
- Handbook of chemical and environmental engineering calculations, by Joseph P Reynolds, John S Jeris, Louis Theodore, John Wiley & Sons, Inc.
- Air Pollution by M N Rao, McGraw, New Delhi
- Environmental Chemistry by A K De, Wiley Eastern Ltd
- Non-Conventional Energy Sources by G.D.Rai