University of Mumbai

Website - mu.ac.in
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Academic Authorities,
Meetings & Services (AAMS)
Room No. 128, M. G. Road, Fort,
Mumbai – 400 032.
Tel. 022-68320033

Re- accredited with A ++ Grade (CGPA 3.65) by NAAC
Category- I University Status awarded by UGC

No. AAMS_UGS/ICD/2024-25/ 455 Date : 24th March, 2025.

To,
The Director,
Garware Institute of Career Education
and Development,
Vidyanagari
Santacruz (East)
Mumbai – 400 098.

Sub : M.Sc (Paint Technology) (Two year)(Sem – I & II).

Sir,

With reference to the subject noted above, this is to inform you that the recommendations made by the **Advisory Committee & Board of Management** of Garware Institute of Career Education & Development at its Meeting held on **4th September, 2023** & resolution passed by the **Board of Deans** at its meeting held on **9th August,2023 vide** Item No. **9.2** have been accepted by the **Academic Council** at its meeting held on **1st November, 2023 vide** Item no. **9.3 (A) 4 (N)** and subsequently approved by the **Management Council** at its meeting held on **14th August, 2024 vide** Item No. **6** that in accordance therewith, in exercise of the powers conferred upon the Management Council under Section 74(4) of the Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017) the following program with Ordinance for Title of the Program, Eligibility and Regulation numbers for Duration of Program, Intake Capacity, Scheme of Examinations, Standard of Passing and Credit Structure along with syllabus of **M.Sc (Paint Technology) (Sem I & II)** (Appendix – 'A') have been introduced and the same have been brought into force with effect from the academic year **2023-24**.

The New Ordinances & Regulations as per NEP 2020 is as follows :-

Sr. No	Name of the Programme	Ordinance no. for Title	Ordinance no. for Eligibility	Duration
A	P.G Diploma in Paint Technology	O.GPA – 27 A	O.GPA – 28 A	Two year
B	M.Sc (Paint Technology)	O.GPA – 27 B	O.GPA – 28 B	
C	M.Sc (Paint Technology)	O.GPA – 27 C	O.GPA – 28 C	One year

2/-

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No. AAMS_UGS/ICD/2024-25/455 Date : 24th March, 2025.

Regulation Nos	
Duration	R. GPA – 61
Intake Capacity	R. GPA – 62
Scheme of examination	R. GPA – 63
Standard of Passing	R. GPA – 64
Credit Structure	R. GPA – 65 A
	R. GPA – 65 B
	R. GPA – 65 C
	R. GPA – 65 D

(Dr. Prasad Karande)
REGISTRAR

A.C/9.3(A)4 (N)/01/11/2023
M.C/6/14/8/2024

****

Copy forwarded with Compliments for information to:-

1) The Chairman, Board of Deans
2) The Dean, Faculty of Science & Technology.
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Director, Department of Information & Communication Technology,
6) The Co-ordinator, MKCL.

Copy forwarded for information and necessary action to :-	
1	The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Dept)(AEM), dr@eligi.mu.ac.in
2	The Deputy Registrar, Result unit, Vidyanagari drresults@exam.mu.ac.in
3	The Deputy Registrar, Marks and Certificate Unit,. Vidyanagari dr.verification@mu.ac.in
4	The Deputy Registrar, Appointment Unit, Vidyanagari dr.appointment@exam.mu.ac.in
5	The Deputy Registrar, CAP Unit, Vidyanagari cap.exam@mu.ac.in
6	The Deputy Registrar, College Affiliations & Development Department (CAD), deputyregistrar.uni@gmail.com
7	The Deputy Registrar, PRO, Fort, (Publication Section), Pro@mu.ac.in
8	The Deputy Registrar, Executive Authorities Section (EA) eau120@fort.mu.ac.in He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
9	The Deputy Registrar, Research Administration & Promotion Cell (RAPC), rapc@mu.ac.in
10	The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA) dy.registrar.tau.fort.mu.ac.in ar.tau@fort.mu.ac.in
11	The Deputy Registrar, College Teachers Approval Unit (CTA), concolsection@gmail.com
12	The Deputy Registrars, Finance & Accounts Section, fort draccounts@fort.mu.ac.in
13	The Deputy Registrar, Election Section, Fort drelection@election.mu.ac.in
14	The Assistant Registrar, Administrative Sub-Campus Thane, thanesubcampus@mu.ac.in
15	The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan, ar.seask@mu.ac.in
16	The Assistant Registrar, Ratnagiri Sub-centre, Ratnagiri, ratnagirisubcentar@gmail.com
17	The Director, Centre for Distance and Online Education (CDOE), Vidyanagari, director@idol.mu.ac.in
18	Director, Innovation, Incubation and Linkages, Dr. Sachin Laddha pinkumanno@gmail.com
19	Director, Department of Lifelong Learning and Extension (DLLE), dlleuniversityofmumbai@gmail.com

Copy for information :-	
1	P.A to Hon'ble Vice-Chancellor, vice-chancellor@mu.ac.in
2	P.A to Pro-Vice-Chancellor pvc@fort.mu.ac.in
3	P.A to Registrar, registrar@fort.mu.ac.in
4	P.A to all Deans of all Faculties
5	P.A to Finance & Account Officers, (F & A.O), camu@accounts.mu.ac.in

To,

1	The Chairman, Board of Deans pvc@fort.mu.ac.in
2	**Faculty of Humanities,** **Dean** 1. Prof.Anil Singh Dranilsingh129@gmail.com **Associate Dean** 2. Dr.Suchitra Naik Naiksuchitra27@gmail.com 3.Prof.Manisha Karne mkarne@economics.mu.ac.in
	Faculty of Commerce & Management, **Dean** 1. Dr.Kavita Laghate kavitalaghate@jbims.mu.ac.in **Associate Dean** 2. Dr.Ravikant Balkrishna Sangurde Ravikant.s.@somaiya.edu 3. Prin.Kishori Bhagat kishoribhagat@rediffmail.com

	Faculty of Science & Technology **Dean** 1. Prof. Shivram Garje ssgarje@chem.mu.ac.in **Associate Dean** 2. Dr. Madhav R. Rajwade Madhavr64@gmail.com 3. Prin. Deven Shah sir.deven@gmail.com
	Faculty of Inter-Disciplinary Studies, **Dean** 1.Dr. Anil K. Singh aksingh@trcl.org.in **Associate Dean** 2.Prin.Chadrashekhar Ashok Chakradeo cachakradeo@gmail.com
3	Chairman, Board of Studies,
4	The Director, Board of Examinations and Evaluation, dboee@exam.mu.ac.in
5	The Director, Board of Students Development, dsd@mu.ac.in DSW direcotr@dsw.mu.ac.in
6	The Director, Department of Information & Communication Technology, director.dict@mu.ac.in

AC-1/11/2023
Item No – 9.3 (A) 4

As Per NEP 2020

University of Mumbai

Title of the program

A- P.G. Diploma in Paint Technology

B- M.Sc. (Paint Technology)(Two Year) } 2023-24

C- M.Sc. (Paint Technology) (One Year)- 2027-28

Garware Institute of Career Education and Development

Syllabus for
Semester- Semester I and II

Ref: GR dated 16th May,2023 for Credit Structure of PG

(with effect from the academic year 2023-24)

Garware Institute of Career Education and Development

UNIVERSITY OF MUMBAI

(AS PER NEP 2020)

Sr. No.	Heading	Particulars	
1	Title of program O: GPA – 27A	A	P.G. Diploma in Paint Technology
	O: GPA – 27B	B	M.Sc. (Paint Technology) (Two Years)
	O: GPA – 27C	C	M.Sc. (Paint Technology) (One Years)
2	Eligibility O: GPA – 28A	A	B.Sc. (Chemistry) or Chemistry as one of the 3 units subject, B.Sc. surface Coatings/ Paint Technology / B. Tech. (Paints or Surface Coatings / Engineering), B.Sc. (Industrial Chemistry / Industrial Chemistry Vocational / Applied Chemistry / Industrial Polymer Chemistry), B.E. (Chemistry Engineering /Printing Technology). All these courses must be from UGC approved Universities / AICTE approved institutions. **OR** Passed Equivalent Academic Level 5.5
	O: GPA – 28B	B	1. The candidate who has successfully completed P.G. Diploma in Paint Technology. 2. The candidate whose Post Graduate Diploma credits are 60% equivalent to M.Sc. Paint Technology & he earns minimum 8 Credits from P.G. Diploma in Paint Technology. 3. As per NEP criteria on the basis of RPL- Recognition of Prior Learning, Candidate to be admitted to 2nd Year subject to He/she securing minimum 50% in the 1st Year assessment of PGDPT & proof of employment of Minimum 2 Years. **OR** Passed Equivalent Academic Level 6.0

	O: GPA – 28C	C	Any Graduate with 4 year U.G. Degree (Honours / Honours with Research) or Equivalent Academic Level 6.0 **OR** Graduate with four years UG Degree(Honours / Honours with Research) program with maximum credits required for award of Minor degree is allowed to take up the Post graduate program in Minor subject provided the student has acquired the required number of credits as prescribed by NEP.
3	R: GPA – 61 Duration of Program	A	1 Year
		B	2 Years
		C	1 Year
4	R: GPA – 62 Intake Capacity	60	
5	R: GPA – 63 Scheme of Examination	NEP 50% Internal – Continuous Evaluation 50% External- Semester End Examination Individual Passing in Internal and ExternalExamination	
6	R: GPA – 64 Standards of Passing	50% in each component	
7	Credit Structure R: GPA – 65A R: GPA – 65B R: GPA – 65C R: GPA – 65D	Attached herewith	
8	Semesters	A	Sem I & II
		B	Sem I, II, III, & IV
		C	Sem I & II
9	Program Academic Level	A	6.0
		B	6.5
		C	6.5
10	Pattern	Semester	
11	Status	New	
12	To be implemented from AcademicYear	From Academic Year 2023-24	

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

Preamble

1) Introduction

- The Paint industry is growing at a very fast rate.
- The production of Paints, Pigments and Resins is increased several times over the years.
- The surface area for application has changed due to Infrastructure development, improved standards of living, expansion of industries and better dwellings.
- This growth requires trained and skilled personnel to take up leading roles. This has created a greater demand for Technologists and is more than the supply including all institutions taken together.

2) Aims and Objectives

- To produce graduates and post graduates who will be able to meet the requirements and challenges at national & international levels in the field of formulation, manufacture and application of paints and allied products
- To inculcate in students, the fundamental and molecular concepts related to resins, polymers, pigments and additives to enable them to develop novel technologies to meet the global standards of eco-friendliness & sustainability.
- To produce technologists with high moral values and professional ethics, who can work with industry hand-in-hand for mutual benefits and to sensitize them for job creation for the society, specially the rural community.

3) Learning Outcomes

- The expansion of paint industry has created good job opportunities to paint technologists.
- The demand exists in manufacturing, application, quality control and techno- commercial aspects in various industries viz., paint, resins, pigments and allied industries, furniture, automobile, plastic, ship building, and printing inks as well.
- Students should be able to apply the acquired knowledge in the professional world related to formulation, manufacture and application of paints, coatings and allied products and should be sensitized technocrats towards using indigenous resources and infrastructure to develop novel technologies compatible with the startup mission of India.
- Graduates should be able to handle research and development assignments in industry and should be welcome candidates for higher studies in high profile national and international institutes/universities with a strong concern for environment and social issues.
- It is also possible to become an entrepreneur or a painting contractor.

4) Any other point (if any)

5) Baskets of Electives

Elective Basket For Semester I, II, III and IV			
Subject	Marks	Credits	Hours
Paint Technology-II	100	4	60 Hours
Cost Management in Paint Industry	100	4	60 Hours
Communication skills for Paint Technocrats	100	4	60 Hours
Practical	100	4	60 Hours
Paint Technology – V	100	4	60 Hours
Printing Ink Technology-II	100	4	60 Hours
Practical	100	4	60 Hours
Paint Technology- VIII	100	4	60 Hours
Production & Operations Management for Paint Industry	100	4	60 Hours
Safety, Health and Environment	100	4	60 Hours
Sales and Distribution Management	100	4	60 Hours

Credit Structure of the program - (Parishisth-1)

Credit Distribution Structure for Two Years/One Year PG (M.Sc. Paint technology) as per NEP-2020

<table>
<tr><th rowspan="2">Year</th><th rowspan="2">Level</th><th rowspan="2">Sem</th><th colspan="3">Major</th><th rowspan="2">RM</th><th rowspan="2">OJT / FP</th><th rowspan="2">RP</th><th rowspan="2">Cum. Cr.</th><th rowspan="2">Degree</th></tr>
<tr><th colspan="2">Mandatory</th><th>Electives Any one</th></tr>
<tr><td rowspan="5">I</td><td rowspan="5">6.0</td><td rowspan="4">Sem I</td><td>Paint Technology-I</td><td>Credits: 4</td><td rowspan="4">Credits 4
Paint Technology-II
OR
Credits 4
Cost Management in Paint Industry
OR
Credits 4
Communication skills for Paint Technocrats
Credits 4
Practical</td><td rowspan="4">Research Methodology
4</td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5">22</td><td rowspan="5">PG Diploma (after 3-yr UG or PG Degree)</td></tr>
<tr><td>Resin Technology I</td><td>Credits: 4</td></tr>
<tr><td>Pigment Technology-I</td><td>Credits: 4</td></tr>
<tr><td>Printing Ink Technology-I</td><td>Credits: 2</td></tr>
<tr><td></td><td></td><td>14</td><td>4</td><td>4</td></tr>
<tr><td rowspan="4">Sem II</td><td>Pigment Technology-II</td><td>Credits: 4</td><td rowspan="4">Credits 4
Paint Technology -V
Credits 4
Printing Ink Technology-II
Credits 4
Practical</td><td rowspan="4"></td><td rowspan="4">FP</td><td rowspan="4"></td><td rowspan="4"></td></tr>
<tr><td>Resin Technology-II</td><td>Credits: 2</td></tr>
<tr><td>Paint Technology – III</td><td>Credits: 4</td></tr>
<tr><td>Paint Technology-IV</td><td>Credits: 4</td></tr>
<tr><td></td><td></td><td></td><td></td><td>14</td><td>4</td><td>0</td><td>4</td><td>0</td><td>22</td><td></td></tr>
<tr><td colspan="3">Cum. Cr. For PG Diploma</td><td colspan="2">28</td><td>8</td><td>4</td><td>4</td><td></td><td>44</td><td></td></tr>
<tr><td colspan="9">Exit Option: PG Diploma (44 credits) after Three Year UG Degree</td><td></td><td></td></tr>
</table>

Abbreviations: Yr.: Year; Sem.: Semester; OJT: On Job Training: Internship/ Apprenticeship; FP:Field projects; RM: Research Methodology; Research Project: RP; Cumulative Credits: Cum.

Year	Level	Sem	Major			RM	OJT/ FP	RP	Cum. Cr.	Degree
			Mandatory		**Electives Any one**					
2	6.5	Sem III	Paint Technology – VI	**Credits: 4**	**Set 1** **Credits 4** Paint Technology-VIII **Set 2** **Credits 4** Production & Operations Management for Paint Industry	-	-	4 RP	**22**	PG Degree after 3-yr UG or PG Degree after 4-yr UG
			Paint Technology –VII	**Credits: 4**						
			Resin Technology-III	**Credits: 2**						
			Quality Management	**Credits: 4**						
				14	**4**	**0**	**0**	**4**	**22**	
		Sem IV								
			Market Research & Product Feasibility	**Credits: 4**	**Set 1** **Credits: 4** Safety, Health and Environment **Set 2** **Credits: 4** Sales and Distribution Management		-	6 RP	22	
			Paint Technology -IX	**Credits: 4**						
			Surface Chemistry & Engineering	**Credits: 4**						
				12	**4**	**0**	**0**	**6**		
Cum. Cr. For 1 Yr PG Degree			**28**		8	4	4		44	
Cum. Cr. For 2 Yr PG Degree			**26**		8	-	-	10	44	
Cumulative Credits			**54**		**16**	**4**	**4**	**10**	**88**	
Exit Option: PG Degree in M.Sc. Paint technology with cumulative credit (88 credits) after Three Year UG Degree										
2 Years-4 Sem. PG Degree (88 credits) after Three Year UG Degree or 1 Year-2 Sem PG Degree (44 credits) afterFour Year UG Degree										

Abbreviations: Yr.: Year; Sem.: Semester; OJT: On Job Training: Internship/ Apprenticeship; FP: Field projects; RM: Research Methodology; Research Project: RP; Cumulative Credits: Cum.

Dr. Keyurkumar M. Nayak,
Director

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

SEMSTER-I								
Subject Code	**Core Subject**	**Assessment Pattern**			**Teaching Hours**			
	Topics	**Internal Marks 50**	**External Marks 50**	**Total Marks (CA) 50/100**	**Theory Hours**	**Practic hours**	**Total Hours**	**Total Credits**
Major Mandatory								
PGDPTS1MJP1	Paint Technology –I	50	50	100	60	--	60	4
PGDPTS1MJP2	Resin Technology-I	50	50	100	60	--	60	4
PGDPTS1MJP3	Pigment Technology-I	50	50	100	60	--	60	4
PGDPTS1MJP4	Printing Ink Technology-I	25	25	50	30	--	30	2
Major ELECTIVES (Any One)								
PGDPTS1MJP5A	Paint Technology-II	50	50	100	60	--	60	4
PGDPTS1MJP5B	Cost Management in Paint Industry	50	50	100	60	--	60	4
PGDPTS1MJP5C	Communication skills for Paint Technocrats	50	50	100	60	--	60	4
PGDPTS1MJP5D	Practical	100		100		60	60	4
Research Methodology								
PGDPTS1P6	Research Methodology	50	50	100	60	0	60	4
	Total	**275**	**275**	**550**	**330**	**60**	**330**	**22**

SEMSTER-II								
Subject Code	**Core Subject**	**Assessment Pattern**			**Teaching Hours**			
	Topics	**Internal Marks 50**	**External Marks 50**	**Total Marks (CA) 50/100**	**Theory Hours**	**Practical hours**	**Total Hours**	**Total Credits**
Major Mandatory								
PGDPTMJS2P7	Pigment Technology-II	50	50	100	60	--	60	4
PGDPTMJS2P8	Resin Technology-II	25	25	50	30	--	30	2
PGDPTS2MJP9	Paint Technology – III	50	50	100	60	--	60	4
PGDPTS2MJP10	Paint Technology – IV	50	50	100	60	--	60	4
Major Electives (Any One)								
PGDPTS2MJP11A	Paint Technology - V	50	50	100	60	--	60	4
PGDPTS2MJP11B	Printing Ink Technology-II	50	50	100	60	--	60	4
PGDPTS2MJP11C	Practical	100		100		60	60	4
Research Project								
PGDPTS2P12	Field projects	100		100	--	120	120	4
	Total	**325**	**225**	**550**	**270**	**180**	**390**	**22**

Subject Code	Core Subject	Assessment Pattern			Teaching Hours			
	Topics	Internal Marks 50	External Marks 50	Total Marks (CA) 100	Theory Hours	Practical hours	Total Hours	Total Credits
	Semester – III							
MPTS3MJP13	Paint Technology – VI	50	50	100	60	--	60	4
MPTS3MJP14	Paint Technology – VII	50	50	100	60	--	60	4
MPTS3MJP15	Resin Technology-III	25	25	50	30		30	2
MPTS3MJP16	Quality Management	50	50	100	60		60	4
	Electives (Any One)							
MPTS3P17A	Paint Technology-VIII	50	50	100	60		60	4
MPTS3P17B	Production & Operations Management for Paint Industry	50	50	100	60		60	4
	Research Project							
MPTS3MJP18	Research Project	100	–	100	–	120	120	4
	Total	**325**	**225**	**550**	**270**	**120**	**390**	22
	Semester – IV							
MPTS4MJP19	Market Research & Product Feasibility	50	50	100	60	--	60	4
MPTS4MJP20	Paint Technology - IX)	50	50	100	60		60	4
MPTS4MJP21	Surface Chemistry & Engineering	50	50	100	60	--	60	4
	Elective (Any One)							
MPTS4P25A	Safety, Health and Environment	50	50	100	60	--	60	4
MPTS4P25B	Sales and Distribution Management	50	50	100	60	--	60	4
MPTS4P26	Research Project	100	–	100		60	60	6
	Total	**300**	**200**	**500**	**240**	**60**	**300**	**22**

SEM. I

Syllabus
(M.Sc. in Paint Technology)
(Sem. I & II)

	SEMESTER –I	Total Hours	Session of 3 hrs each
	Major Mandatory		
PGDP TS1 MJP1	**Paint technology-I**		
	Aim and Objectives ✓ The composition of paints and their classifications. ✓ The chemical modifications of fixed oils to enhance their properties. ✓ The composition and properties of driers ✓ To study the functionality, degree of polymerization and molecular weight and their determination		
	Learning Outcomes ✓ Understand the composition and functions of Paints & Coatings. ✓ Understand the composition and properties of various vegetable oils. ✓ Understand the deficiencies of vegetable oils and to apply to improve them ✓ upon, by chemical modifications. ✓ Understand the compositions and properties of various driers and apply in ✓ coatings		
	Unit I	**9**	**3**
	Definition of Paint, Composition of paints, Types of Paints, varnishes and lacquers; their components and functions; coating binders, media/vehicles		
	Unit II	**12**	**4**
	Classification of paints, convertible and non-convertible, Coatings combination of paints, film formation mechanism & merits &demerits		
	Unit III	**9**	**3**
	Paints in the Indian context, solvent borne paints ,water –		

	borne paints, classification of oils, yellowing and non-yellowing oils, dehydrated castor oils; maleinized oils & water soluble oils		
	Unit IV	**12**	**4**
	Essential, mineral and fixed oils; sources and composition of glyceride oils; molecular structure of tri-glyceride oils; non-glyceride components of oils; constitution and molecular structure of fatty acids, Constitution of drying oils, properties, Treated oils, modification of oils		
	Saponification value, Iodine value,		
	Unit V	**12**	**4**
	Polymer technology, Detailed classification of polymers Addition, condensation, Techniques of polymerization: bulk, solution, suspension, emulsion etc.		
	Unit VI	**6**	**2**
	Coating Driers: Constitution; active & auxiliary, primary and secondary; surface & through driers; mechanism of drier action; driers for solvent based coatings; future trends.		
	Reference Books		
	1. Organic Coating Technology, Volume I, by Henry Fleming Payne, John Wiley & Sons. 2. Basics of Paint Technology, Part I & II, by V.C. Malshe &MeenalSikchi 3. Surface Coatings, Volume I, by OCCA Australia (Prepd.), Chapman and Hall 4. Outlines of Paint Technology, III Ed. By W.M.Morgans, Edward Arnold 5. Text book of polymer Science by Bill Meyer, John Wiley and Sons 1984 6. Principles of Polymer Science, by Bahadur and Sastry, Narosa Publishing House 2002. 7. Polymer Science by Gowarikar, John Wiley and Sons 1986. 8. Handbook of Thermoplastics, Second Edition Olagoke Olabisiby CRC Press2015		
PGDPTS1 MJP2	**Resin Technology-I**		
	Aim and Objectives ✓ Sources of various natural resins and their modifications for their use in coatings. ✓ The fundamental concepts of resinification /polymerization to prepare synthetic resin. ✓ Synthetic alkyd resins: preparation, properties and applications.		

	Learning Outcomes ✓ Physical and chemical examination of natural resins and their modifications ✓ Production of shellac and its various modifications ✓ Study natural high polymers and plasticizers and their application in surface coatings		
	Unit I	**6**	**2**
	Fundamentals of organic chemistry-Hydrocarbons, IUPAC nomenclature, structures and common names		
	Unit II	**9**	**3**
	Aliphatic –Aromatic, Oxygenated compounds, oils, amines,		
	Isocyanates		
	Unit III	**3**	**1**
	Different functional groups		
	Unit IV	**12**	**4**
	Reactive groups and non-reactive groups chemical reactions		
	Natural materials used in resins and varnishes.		
	Resins and polymers, resinous state and degree of polymerization, classification of resins, classification of natural resins, sources, availability and properties of fossil & semi fossil resins, processing of natural resins		
	Unit V	**12**	**4**
	Cellulosic polymers: sources, constitution and properties of natural cellulose, chemical modifications of cellulose, ethers, esters and mixed esters, nitro cellulose (NC)		
	Plasticizers : definitions, role of plasticizers, internal and external plasticizers- primary and secondary plasticizers, mechanism of plasticization, types of plasticizers – oils, resin type and simple chemicals such as phthalates, sebacates, phosphates, camphor, polymeric and non-phthalate plasticizers etc. molecular structure, properties and uses of individual plasticizers		
	Unit VI	**9**	**3**
	Technology of Thermoplastics and Thermoset Polymers		

	Unit VII	**6**	**2**
	Raw materials & their properties, oils & fatty acids for alkyds, chemistry and formulation of various alkyds, Modified alkyds long medium, medium oil, Short oil modified alkyds, Alkyd resins-		
	Unit VIII	**3**	**1**
	Equipment's for laboratory process. Plant Equipment's and set up		
	Reference Books		
	1. Advance Organic Chemistry by Jerry March, Third Edition Wiley Eastern Limited, New Delhi. 2. Polymer Science by V. R. Gowarikar, N. V. Vishwanathan and J. Shridhar, Wiley Eastern Ltd., New Delhi 3. Modern Surface Coatings, by P.Nylon and E. Sunderland. 5. Outlines of Paint Technology, III Ed.; by W.M.Morgans, Edward Arnold 6. Organic Coatings: Science and Technology, Volume I; by Z.W.Wicks, F.N.Jones and S.P.Pappas, Wiley-Interscience 7. Handbook of coatings additives, by L.J. Calbo (Ed.), Marcel Dekker Inc. 8. Technology of Paints, Varnishes and Lacquers by C.R.Martin 9. Principles of Polymer Science, by Bahadur and Sastry, Narosa Publishing House 2002. 10. Polymer Science by Gowarikar, John Wiley and Sons 1986. 11. Handbook of Thermoplastics, Second Edition Olagoke Olabisiby CRC Press2015 Clayden, J., Greeves, N., Warren, S.; Organic Chemsitry; 2nd ed.; Oxford University Press (2012)		
PGD PTS1 MJP4	**Printing Inks Technology-I**		

	Aim and Objectives ✓ To understand various types of printing processes, substrates and inks used ✓ To evaluate various raw materials used in printing inks ✓ To understand ink characteristics and formulate letterpress and lithographic inks ✓ To formulate inks for various applications ✓ To solve various ink related problems

	Learning Outcomes ✓ Understand various printing processes, types of substrates and inks used. ✓ Understand various ink raw materials, their properties, testing and evaluation, and applications.		
	Unit I	**3**	
	General Introduction and historical background of Paints and Inks.		
	Unit II		
	Definition of Paints, Inks, Coatings, Varnishes, Lacquers.	**9**	
	Definition of Inks. Classifications of Inks. Inks Ingredients and their functions. Printing Ink Types Based on Process & Functions		
	Unit III		
	Difference between Printing Inks and paints, Different substrates for printing, Drying of printing inks,	**9**	
	Unit IV		
	Manufacture of paper qualities and properties of paper	**6**	
	Unit V		
	Testing and analysis methods for printing inks	**3**	
	Reference Books		
	1. Printing Ink Manual, by R. H. Leach & R. J. Pierce 2. Ink Technology for Students & Printers; by E.A. Apps 3. Water based inks by Lad 4. The Printing Ink Manual, R. H. Leach, Springer Science & Business Media, 30- Sep-1993 - Art - 993 pages		
PGDP TS1 MJP3	**Pigment Technology-I**		

	Aim and Objectives ✓ Properties of extenders and pigments ✓ Characterization (testing and evaluation) of properties of pigments and extenders. ✓ Manufacturing of Natural and Synthetic Pigments ✓ Role of extenders and pigments in paints, printing inks, leather, plastics, rubbers etc ✓ To understand various types of paint additives used		
	Learning Outcomes ✓ Understand the various properties of pigments and extenders and determine them by analytical methods ✓ Study the manufacturing processes of inorganic prime pigments ✓ Prepare extender pigments and study their properties and applications ✓ Study the manufacturing processes and determine various properties of white and black pigment ✓ Prepare coloured various inorganic pigments. ✓ Understand various additives used in paints		
	Unit I	**6**	**2**
	Properties of pigment		
	Definition, classification of pigments. Properties of pigments, particle size, opacity, surface energy and surface characteristics, particle size and distribution, surface area by BET techniques, pigment particle shape		
	Unit II	**9**	**3**
	Inorganic prime pigments		
	Definition and classification of inorganic pigments. General methods of manufacturing of natural and synthetic inorganic pigments, colour theory of inorganic pigments, surface treatment of pigments. Manufacturing, applications and merits and demerits of nano pigments		
	Unit III	**6**	**2**
	White and black pigments		
	TiO_2, ZnO, Zinc phosphate, Antimony oxide, Black pigments		
	Unit IV	**15**	**5**

	Colour pigments		
	Source, manufacture, properties and uses of natural and synthetic iron oxides, lead chromates, molybdate, chromegreen, chromium oxide, cadmium pigments, prussian and ultramarine blue, mercuric sulphide, cobalt blue, cadmium pigments, synthetic inorganic complexes and mixed pigments.		
	Unit VI	**6**	**2**
	Wetting & Dispersing Agents, Defoamers & Antifoams, Adhesion Promoters,Organofunctional Silanes, Organometallic Compounds		
	Unit VI	**6**	**2**
	Biocides and Heat & Light Stabilizers		
	Characteristics of Bacteria & Fungi, Enzyme production and effect of biocidal effect, Heat & Light Stabilizers- Photooxidation of polymers		
	Unit VII	**6**	**2**
	Corrosion Inhibitors, Driers, and Additives for Special Function		
	Corrosion Inhibitors, Driers Composition		
	Unit VIII	**6**	**2**
	Surfactants- Theory, Properties & Types		
	Surfactants- Theory of surface action, effect and behavior of surface active agents on different interfaces, Classification		
	Reference Books		

	1. Pigment Hand book Vol. I, II and III by T.C.Patton. 2. Basics of Paint Technology, Part I & II, by V.C.Malshe&MeenalSikchi. 3. Pigments, dyestuffs and Lakes, part six, Paint Technology Manuals. 4. Organic Coating Technology Vol. I & II by H.F.Payne. 5. Outlines of Paint Technology by W.M.Morgan. 6. Paints and Surface Coatings byLambourne 7. Technology of Pigments by A.B. Karnik 8. Handbook of Coating Additives by Leonard J Calbo 9. Additives for Coatings by Johan Bieleman 10. Chemistry and Technology of Polymer Additives by Al-Malaika		
	Major Electives		
PGDP TS1M JP5A	**Paint Technology-II**		
	Aim and objective ➢ To understand the basic concepts decorative paints. ➢ The fundamental concepts of various Architectural Coatings& their Formulations ➢ To understand Classification of decorative paints. ➢ To understand the various raw materials used for decorative paints ➢ To understand the acrylic distemper, acrylic emulsion and their importance		
	Learning Outcomes ➢ Understand the basic concepts about interior, exterior paintings and functions of ingredients ➢ Understand the different types of distempers and their classifications ➢ Learn the importance and usage of stainers. ➢ Learn the solvent based and water based thinner		
	Unit I	**6**	**2**
	Meaning of Decorative and Architectural paints. water based & solvent based coatings		
	Unit II	**9**	**3**
	Classification of Paints –Interior and exterior coatings. Various types e.g. Distemper emulsion, premium, dust proof, rain guard etc.		
	Unit III	**6**	**2**

	Selection of raw materials for architectural and ecofriendly coatings, effect of solvent(s), drying mechanism of paint. Green building concept. VOC and its calculation as per BIS and ASTM.		
	Unit IV	**12**	**4**
	Architectural coating systems: Primer-surfacer/Surfacer, undercoats, putties, sound deadeners & underseal		
	Plastic emulsion paints: interior and exteriors; properties and uses,		
	Eco-friendly coatings, application and merits & demerits coatings. high solids coatings.		
	Unit V	**9**	**3**
	Water thinnable primers, oil bound distempers, acrylic washable distempers, acrylic emulsion and premium emulsion, Enamel paint and texture finishes etc.		
	Unit VI	**9**	**3**
	Tinters, universal stainers, Importance and applications		
	Unit VII	**9**	**3**
	Usage of stainers Dealer tinting systems and colourants. Basic concept of flow, rheology & stability of colourants in order to have the final shade accuracy		
	Reference Books		
	1. The Selection of Decorative Paints. In: Surface Coatings. Springer, Dordrecht. https://doi.org/10.1007/978-94-010-9810-6_20 2. Complete Book of Decorative Paint Techniques. Hardcover – Import, 10 May 1994 3. Handbook of Paint Raw Materials Hardcover – Import, 31 December 1989 4. Handbook of Paint Raw Materials Hardcover – 1 April 1982		
PGDPTS 1M JP5B	**Cost Management in Paint Industry**		
	Aim and Objective ➢ Understanding the market dynamics ➢ Economic decision making ➢ Valuation and pricing ➢ Impact of economics factors ➢ Policy implications ➢ Globalization and international trade		

	Learning Outcomes ➢ Students develop a solid understanding of fundamental economic concepts such as supply and demand ➢ pricing theory, market structures, and resource allocation ➢ Learners acquire skills in valuing paintings, including assessing factors such as artistic merit, rarity, provenance, condition, and market demand ➢ Students learn how to conduct market analysis within the art sector, including identifying market trends, analyzing market data		
	Unit I	9	3
	Components of Cost of Painting. Methods of Calculation of remuneration to labour on the basic of work done, Bonus System.		
	Unit II	3	1
	Minimum wages and compliance.		
	Unit III	3	1
	Accounting of idle time – achieving maximum utilization of labour – multi skilling.		
	Unit IV	12	4
	Direct and Indirect expenses – cost record and principles involved Fixed cost, variable cost – wastage and scrap – Accounting procedures and methods.		
	Unit V	6	2
	Duties of work execution – Difference in working in a plant and executing work on the basis of painting contracts.		
	Unit VI	6	2
	Tenders, meaning of tenders – Procedure of floating a tender – activities involved.		
	Unit VII	3	1
	Measurements – importance – Right way of taking measurements – Demonstrating with actual examples such as 1BHK, 2 BHK flats – critical measurements.		
	Unit VIII	6	2
	Reading of drawings – Actual terminology involved. Estimation – How to give estimation, what are the essential and significant components involved.		
	Unit IX	6	2
	Quotations – Generating quotations – Basis to arrive at the quotations – submission of quotations.		
	Unit X	3	1

	Billing – Requirements for billing – Registration of firm with various government bodies – PWD etc.		
	Unit XI	3	1
	Copy rights, Trademark, Patents etc.		
	Reference Books		
	1. Process Plant and Equipment Cost Estimation, Kharbanda O. P.		
	2. Plant Design and Economics for Chemical Engineers, Peters M.S., Timmerhaus K. D.		
	3. Chemical Project Economics, Mahajani V. V. and Mokashi SM.		
PGDPTS 1M JP5C	**Communication skills for Paint Technocrats**		
	Aim and Objective ➢ To understand the basic concepts of interview. ➢ To understand Written communication. ➢ To understand the different Business Letter Writing. ➢ To understand the Presentation skills		
	Learning Outcomes ➢ Understand the basics of technical communication. ➢ Developing the skills of variety of the words like synonyms and writing skills. ➢ Draft a business letters and resume for to develop for industry. ➢ Explore the body language for perfect professional presentation. ➢ Present themselves effectively and in a confident manner in the contemporary competitive market.		
	Unit I	**9**	**3**
	Introduction to communication-Elements and process of		
	communication barriers to effective communication.		
	Unit II	**9**	**3**
	Listening skills-Process of listening –strategies for effective listening.		
	Unit III	**6**	**2**
	Group Discussion. Objective and process interviews, types of interviews.		

	Unit IV	**9**	**3**
	Business letters, Principles importance and objective written communication		
	Unit V	**12**	**4**
	Reports – significance salient features, Preparation and planning, Types of reports		
	Unit VI	**6**	**2**
	Structure of reports-style of reports, memo reports, Presentation		
	Unit VII	**9**	**3**
	Dynamics of professional presentation public speaking, Types of speeches.		
	Reference Books		
	1. Effective Technical Communication, by Barun K. Mitra, Oxford University Press 2. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan, TataMcGraw Hill, N.D. 3. Developing Communication Skills by Krishna Mohan & Meera Banerjee, Macmillan India 'Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi		

PGDPTS1MJP5D	**Practical**	60	4
1	To determine Bulk density of a powder sample		
2	To determine oil absorption of pigment/extender		
3	To find out density of liquid water and turpentine		
4	To determine specific gravity of pigment / extender		
5	To determine % volatile matter of pigments and extenders		
6	Sieve analysis		
7	Solubility Product and Precipitation		
8	To observe appearance of pigments and extenders		
9	The standard test methods for bleeding of pigment.		

10	To check the evaporation rate of various solvents		
11	Hiding property of white pigment		
12	Weight per litre of paint using weight per litre cup		
13	To Determine reducing strength of pigment.		
14	To find thermosetting and thermoplastic coating.		
15	To determine the viscosity of liquid paint on b4 ford cup		
PGDP TS1P6	**Research Methodology**	**60**	**4**
	Unit-I: Introduction	**30**	**10**
	Meaning and Objectives of Research		
	2 Types of Research – (a) Pure, Basic and Fundamental (b)		
	Applied (c) Empirical (d) Scientific & Social (e) Historical (f)		
	Exploratory (g) Descriptive (h) Causal		
	3. Concepts in Research: Variables, Qualitative and Quantitative Research		
	4. Stages in Research Process		
	5. Characteristics of Good Research		
	6. Hypothesis - Meaning, Nature, Significance, Types of Hypothesis, Sources		
	7. Research Design – Meaning, Definition, Need and		
	Importance, Steps in Research Design, Essentials of a Good		
	Research Design, Areas/Scope of Research Design and Types -		
	Descriptive, Exploratory and Causal		
	8. Sampling – (a) Meaning of Sample and Sampling, (b)		
	Methods of Sampling - (i) Non Probability Sampling –		

	Unit-II	**15**	**5**
	Literature survey: Research gate, Google Scholar, Sci-finder, Science direct, open library, open journal access etc.		
	Unit-III	**15**	**5**
	Writing of research articles, Patents, Book chapters etc.		

SUBJECT-WISE SYLLABUS

	SEMESTER –II	Total Hours	Session of 3 hrs each
	Major Mandatory		
PGDPTMJS2P7	**Pigment Technology-II**		
	Aim and Objectives ✓ To understand various properties of pigment and extender. ✓ To understand basics of colour and colour- mixing. ✓ To understand manufacturing of Classical Azo pigments and dyes. ✓ To understand manufacturing of Blue pigment.		
	Learning Outcomes ✓ Study chemistry of colour, colour-mixing and its applications in aesthetics, psychology and safety ✓ Study Industrial Organic pigments, raw materials and chemical reactions for their synthesis ✓ Classify and prepare various AZO pigments ✓ Study Metallic, Functional and Effect pigments and their applications in surface coatings ✓ Study High performance and Composite pigments and identify organic pigment by analysis		
	Unit I	**6**	**2**
	Comparison of organic and inorganic pigments, Definition of dyes, pigments dyestuffs, toners and lakes Organic Pigments- Colour and structure, Classification of organic pigments.		
	Unit II	**12**	**3**
	Synthesis of Azo Pigments, Diazotisation and coupling reactions. Toluidine Reds, Hansa yellow, Benzidine yellows, Basic dye stuffs, Phthalocyanines pigments		
	Unit III	**12**	**4**
	Source, manufacture, properties and uses of Metallic pigments (aluminium, zinc, copper alloys, stainless steel), Pearlescent and luminescent pigments, Anti-corrosive and anti-fouling pigments		
	Unit IV	**15**	**5**

	Metal free phthalocyanine pigments, Introduction to high performance pigments & dyes, such as azocondensation, quinocridones, perylene, perinone, dioxazine-carbazole, phthalocynines, diketopyrrolopyrrol (DPP), quinophathalones, anthraquinone, and vat pigments		
	Unit V	**3**	**2**
	Introduction to colour index name and number. Colour coding systems		
	Unit VI	**12**	**4**
	Type of solvents, Characteristics of solvents, Solvent power,		
	Solvent Index, Rate of evaporation of solvents, Latent		
	solvents and diluents.		
	Reference Books		
	1. The Chemistry and Physics of Organic Pigments by L. S. Pratt. 2. Pigment Hand book Vol. I, II and III by T. C. Patton. 3. Basics of Paint Technology, Part I & II, by V. C. Malshe & Meenal Sikchi 4. Pigments, dyestuffs and lakes, part six, Paint Technology Manuals. 5. Organic Coating Technology Vol. I & II by H. F. Payne. 6. Industrial Organic Pigments by Dr. Willy Hurbst		
PGDPTMJS2P8	**Resin Technology-II**		
	Aim and Objectives ✓ Dependence of properties of resins and polymers on their structure and chemistry. ✓ Phenolic resins and amino resins as co-cure resins. ✓ Epoxy resins and epoxy esters formulations and their uses		
	Learning Outcomes ✓ Study chemistry and prepare phenolic and amino resins ✓ Study chemistry and prepare epoxy resins ✓ Study chemistry and prepare alkyd resins		
	Unit I	**6**	**2**
	Alkyd Resins, comparison of processes, Non-drying alkyds,		

	styrenated alkyds, natural and synthetic resin modified alkyds, water soluble alkyds		
	Unit II	**6**	**2**
	Amino Resins UF & MF resins, Preparation and properties.		
	Unit III	**9**	**2**
	Epoxy resins, properties -reaction with phenol and UF		
	resins, cold cure epoxy resins, Epoxy esters.		
	Unit IV	**9**	**3**
	Unsaturated polyester resins, basic constituents, cross		
	linking reaction, uses of additives, general property.		
	Reference Books		
	1. Organic Coating Technology, Volume I & II; by Henry Fleming Payne 2. Surface Coatings, Volume I & II; by OCCA Australia 3. Basics of Paint Technology, Part I & II; by V. C. Malshe & Meenal Sikchi 4. Outlines of Paint Technology; by W. M. Morgans 5. The chemistry of organic film-formers, by D. H. Solomon, R.E. Krieger Pub. 6. Introduction to paint chemistry; by G.P.A. Turner, Chapman and Hall 7. A Manual for resins for surface coatings; by P. K. T. Oldring		
PGDPTS2 MJP9	**Paint Technology-III**		
	Aim and Objectives ✓ The role and dosage of additives and principles of coating formulation. ✓ The Pigment-Binder geometry, PVC and CPVC of paints. ✓ The principles of coating manufacture. ✓ Formulate paint formulation considering various ingredients		

	Learning Outcomes ✓ Study various additives and their application in surface coatings. Formulate coatings for various application ✓ Study the principles of coating manufacture and their applications ✓ Study various equipment and machinery used in paint manufacture, their selection, calculations involved in efficient operation, economic considerations, etc. ✓ Apply knowledge of properties of all the raw materials for formulating and preparing different types of paints.		
	Unit I	**6**	**2**
	Colloidal chemistry of coatings, surface chemistry of pigment, Guidelines and inputs for Paint formulation, knowledge of ingredients, Rheology, Viscosity and flow properties		
	Unit II	**9**	**3**
	For solvent thinned paints : Wetting and dispersing agents, anti-settling , anti-sag, bodying agents/ thickeners, anti-skinning agents, anti-flood & anti-float agents, biocides, thixotropic agents, leveling and flow control, mar and slip aids, adhesion promoters, heat and light stabilizers , metal carboxylates (driers), Waxes and surfactants		
	Unit III	**9**	**3**
	For water- thinned /latex (emulsion) paints : surface active agents, protective colloids and thickeners, Biocides, Algecides, pH buffers, coalescing aids, wet-edge additive, base-tinter compatiblizers, sequestering agents, miscellaneous- organoclays and silicone additives.		
	Unit IV	**6**	**2**
	Importance of PVC and CPVC – Variation in properties of		
	coatings with change in pigment volume concentration.		
	Unit V	**9**	**3**
	Steps in Paint manufacturing, Phenomenon of Mixing, Soaking, wetting, grinding, dispersion and stabilization. Dispersion processes, Daniel wet & flow point, transparency & opacity concept & it's importance, flocculation test etc.		

	Unit VI	**6**	**2**
	Composition of grinding vehicle, Classification of grinding equipment, important considerations in pigment dispersion and stabilization. Dispersion for aqueous media, high solids coatings.		
	Unit VII	**15**	**5**
	Requirement for different equipments:		
	Heavy duty mixtures, double blade mixers, sigma mixture, Ball Mill, Pug Mills, Sand Mill (advantages a& disadvantages of sand mill), edge runner roller mills, Hammer mills, jet mills, Double and Triple Roll Mills, Attritors etc. Ball and Pebble mills: Advantages & disadvantages, physical factors affecting the performance of ball mill, critical & optimum speed of ball mill.		
	Reference Books		
	1. Organic Coating Technology, Vol. I & II, By: H. F. Payne 2. Outlines of Paint Technology, By: W. M. Morgan 3. Basics of Paint Technology, Part I & II, by V. C. Malshe & Meenal Sikchi 4. Surface Coatings, Volume I & II; by OCCA Australia 5. The chemistry of organic film-formers, by D. H. Solomon, R. E. Krieger Pub. 6. Introduction to paint chemistry; by G.P.A. Turner, Chapman and Hall 7. Paint and surface coating theory and practical II edition R. Lam Bournee and TA Striven		
PGDPTS2 MJP10	**Paint Technology-IV**		
	Aim and Objectives ✓ The fundamental concepts of powder coatings ✓ To understand composition and properties of powder coatings ✓ To understand composition and properties of marine paints ✓ To understand about surface preparation and application of paints on various surfaces.		

	Learning Outcomes ✓ Understand the basic concepts about powder coatings, their ingredients, and functions of ingredients and classification of powder coatings ✓ Understand the composition and properties of various raw materials for marine coatings. ✓ Prepare and paint various types of substrates ✓ To understand composition and properties of coil coatings		
	Unit I	**3**	**1**
	Meaning of Protective Coatings-Development of protective		
	Coatings		
	Unit II	**9**	**3**
	Powder coatings-classification, Thermoplastic &		
	Thermosetting powder Coatings, Demand for powder Coatings,		
	Unit III	**6**	**2**
	Properties of powder coatings –Properties and application		
	of powder coatings		
	Unit IV	**6**	**2**
	Merits and Demerits of powder coatings–surface		
	preparation for powder application		
	Unit V	**9**	**3**
	Fluidized bed technique –Electro fluidized bed technique –		
	Electrostatic spraying-Powder coating, booths-Recovery System		
	Unit VI	**6**	**2**
	Marine coatings-Function of these coatings, painting of a		

	ship as a unique system.		
	Unit VII	**6**	**2**
	Surface preparation-Primers and top coats, High performance coatings-		
	Unit VIII	**3**	**1**
	Corrosion- Types of corrosion -Corrosion control system-		
	Fouling–Anti-foulings		
	Unit IX	**6**	**2**
	Coils coatings- Types of coatings –Application methods –		
	Properties and usage of coil coatings		
	Reference Books		
	1. Resins for Surface Coatings, Polyurethanes Polyamides Phenolplasts Aminoplasts Maleic Resins (Waterborne & Solvent Based Surface Coatings Resins & Applications) (Volume III) Volume III Edition 2. Basics of Paint Technology Part II, Part 2, V. C. Malshe, Prakash C. Malshe, 2008 - Coatings - 624 pages 3. Outlines of Paint Technology Hardcover – December 1, 2000 by Morgan (Author) 4. A Practical Course in Polymer Chemistry S. H. Pinner, Borough Polytechnic, London, Pergamon Press, the., New York, 1961 5. Polymer Science by Gowarikar, John Wiley and Sons 1986. 6. Powder coatings vo.-1 and vol. -2, by Hester		
	Major Electives		
PGDPTS2 MJP11A	**Paint Technology – V**		

	Aim and Objectives ➢ To understand the basic concepts various substrates for paint application. ➢ To understand Impurities on the surface. ➢ To understand the different pretreatment process. ➢ Different paint application techniques ➢ Different paint and paint film defects and remedies to overcome them.		
	Learning Outcomes ➢ Understand the different methods of preparing surfaces for painting. ➢ Apply the knowledge of pretreatment methods to ferrous and non-ferrous substrates. ➢ Learn about various methods of application of paints. ➢ Understand the basic concepts metal, wood, paper and plastics substrates. ➢ Apply knowledge of paint application by brush, spray etc.		
	Unit I	**12**	**4**
	Types of substrates for application of decorative and		
	architectural coatings- properties of these substrates –		
	Surface preparation- purpose of surface preparation- pretreatment for metal, plastic, masonry , wood etc. surface.		
	Unit II	**9**	**3**
	Different methods of cleaning (Physical & chemical methods). Importance of putties- water proofing chemicals, crack filling and plaster of paris.		
	Unit III	**9**	**3**
	Methods of application – conventional spraying Principles – requirements –transfer efficiency and Their advantages and limitations.		
	Unit IV	**9**	**3**
	Various application techniques: Brushing- roller coating – spray application, Airless painting- Advantages, disadvantages – application- electrostatic, merits and demerits		
	Unit V	**6**	**2**
	Guidelines for painting- painter kits.		
	Unit VI	**9**	**3**

	Uses of ladders, scaffoldings- safety measures, Basic colour theory, shade cards- colour selection-shade matching at site.		
	Unit VII	**6**	**2**
	Introduction to dealer tinting system.		
	Reference Books		
	1. Good painting practices vol. 1 by Joseph Bigos 2. Surface Coatings, Vol. I & II; by: OCCA, Australia 3. Outlines of Paint Technology; by: W. M. Morgan 4. Surface Coating Technology; by: Swaraj Paul 5. Basics of Paint Technology (Part II); by: Malshe & Sikchi		
PGDPTS2 MJP11B	**Printing Ink Technology-II**		
	Aim and Objectives ➢ To understand various types of printing processes, substrates and inks used ➢ To evaluate various raw materials used in printing inks ➢ To understand ink characteristics and formulate letterpress and lithographic inks ➢ To formulate inks for various applications ➢ To solve various ink related problems		
	Learning Outcomes ➢ Understand various printing processes, types of substrates and inks used. Understand various ink raw materials, their properties, testing and evaluation, and applications.		
	Unit I: Raw Materials for Printing Inks	**9**	**3**
	Evaluation of raw materials for use in printing inks: pigments, dyestuffs, oils, resins (natural and synthetic), solvents, plasticizers, waxes, driers, miscellaneous additives (chelating agents, anti-oxidants, surfactants, deodorants, defoaming agents, laking agents), raw materials for radiation curing systems (pigment selection, prepolymers, reactive diluents, photo-initiators, additives, and inhibitors)		
	Unit II: Printing Processes	**15**	**5**

	Different printing processes such as offset, flexographic printing, gravure printing, screen printing, digital printing, Intaglio printing, etc. Developments in printing processes for different metallic and non-metallic substrates		
	Unit III: Paste Inks	**15**	**5**
	Letterpress inks: general characteristics, types of presses, letterpress ink formulation, ink related problems and their possible solutions, lithographic inks: general characteristics, formulation of offset inks, inks for packaging, ink-related problems, and their possible solutions, web-offset inks for paper and board. Formulation of printing inks for different applications: metal decorating inks, two-piece can decoration inks, dry-offset inks.		
	Unit IV: Liquid Inks	**15**	**2**
	Gravure inks, general characteristics, formulating principles, inks and varnishes for specific end-use applications, printing ink faults. Flexographic inks: general characteristics of the inks, formulating principles. Flexo and Gravure inks for flexible packaging; Screen inks: general characteristics, screen inks for paper, plastics, textiles; Inks for electronics industry; ultra-violet and electron-beam curing inks; edible and soluble packaging inks; daylight-florescent inks.		
	Unit V	**6**	**2**
	General characteristics, screen Inks for paper, plastics, textile, leather, wood, glass etc. Daylight fluorescent inks, Speciality screen inks, Inks for the electronics industry, Ultra-violet and electron-beam curing inks		
	Reference Books		
	1. The Printing Ink Manual, R. H. Leach, Springer Science & Business Media, 30-Sep-1993 - Art - 993 pages		
	2. Printing Ink Technology Books Industrial Technologies, India Nai Sarak, New Delhi, Delhi		
	3. Gravure: Process and Technology Hardcover – Import, Dec 1997by Gravure Association of America (Author)		
	4. Ink Technology for Students & Printers – by EA Apps		

	M.Sc. Paint Technology: SEM-II		
PGDPTS2 MJP11C	**Practical**	60	4
1	To find the viscosity of paint		
2	Weight per litre of paint by using the weight per litre cup		
3	To find % Non- Volatile matter present in the paint		
4	Finish on Hegman Guage		
5	Drawdown using applicator		
6	Normality of a solution		
7	The pH of given liquid / solutions.		
8	Wood finishing		
9	To Determine flocculation of paint		
10	The concept of covering capacity		
11	To Determine acid value of acid material		
12	To determine acid value of acid materials (Resin sample)		
13	To determine the Amine value		
14	Hiding property		
15	Reducing strength		
16	Preparation of colour pigment		
17	Preparation of water based white paint		
18	Preparation of solvent based white paint		
19	To Determine wash ability of paint		
PGDPTS2 P12	**Field projects**	**120**	**4**

PASSING PERFORMANCE GRADING :
The Performance Grading of the learner shall be on ten point scale be adopted uniformly.

Letter Grades and Grade Point

Semester GPA/ Program CGPA Semester / Program	% of Marks	Alpha-Sign/Letter Grade Result	Grading Point
9.00 – 10.00	90.0 - 100	O (Outstanding)	10
8.00 - < 9.00	80.0 < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 < 60.0	B (Average)	6
5.00 - < 5.50	50.0 < 55.0	C (Pass)	5
Below 5.00	Below 50	F (Fail)	0
AB (Absent)		Absent	

NOTE : VC : Vocational Courses, SEC : Skill Enhancement Courses, AEC : Ability Enhancement Courses, VEC : Value Education Courses, VSC : Vocational Skill Course, IKS : Indian Knowledge System, OJT: On The Job Training, FP: Field Projects.

The performance grading shall be based on the aggregate performance of Internal Assessment and Semester End Examination.

The Semester Grade Point Average (SGPA) will be calculated in the following manner: SGPA = $\sum CG / \sum C$ for a semester, where C is Credit Point and G is Grade Point for the Course/ Subject.

The Cumulative Grade Point Average (CGPA) will be calculated in the following manner: CGPA = $\sum CG / \sum C$ for all semesters taken together.

PASSING STANDARD:

Passing 50% in each subject /Course separate Progressive Evaluation (PE)/Internal Evaluation and Semester-End/Final Evaluation (FE) examination.

A. Carry forward of marks in case of learner who fails in the Internal Assessments and/ or Semester-end examination in one or more subjects (whichever component the learner has failed although passing is on total marks).
B. A learner who PASSES in the Internal Examination but FAILS in the Semester-end Examination of the Course shall reappear for the Semester-End Examination of that Course. However, his/her marks of internal examinations shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.
C. A learner who PASSES in the Semester-end Examination but FAILS in the Internal Assessment of the course shall reappear for the Internal Examination of that Course. However, his/her marks of Semester-End Examination shall be carried over and he/she shall be entitled for grade obtained by him/her on passing

ALLOWED TO KEEP TERMS (ATKT)

A. A learner shall be allowed to keep term for Semester II irrespective of the number of heads/courses offailure in the Semester I.

B. A learner shall be allowed to keep term for Semester III wherever applicable if he/she passes each ofSemester I and Semester II.

OR

C. A learner shall be allowed to keep term for Semester III wherever applicable irrespective of the numberof heads/courses of failure in the Semester I & Semester II.

D. A learner shall be allowed to keep term for Semester IV wherever applicable if he/she passes each ofSemester I, Semester II and Semester III.

OR

E. A learner shall be allowed to keep term for Semester IV wherever applicable irrespective of number ofheads/courses of failure in the Semester I, Semester II, and Semester III

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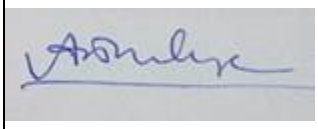
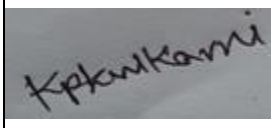
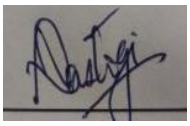
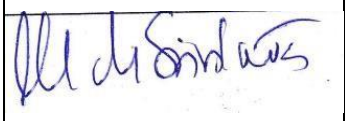
Team for creation of syllabus

Sr. No.	Name of the Members	College Name	Sign
1	Dr. Keyurkumar M. Nayak, Director, UM-GICED	Director, UM-GICED	
2	Dr. Aleem Ansari	Course Coordinator, UM-GICED	
3	Mr. Vivek Bangale	Tuff Coat Industry, Pune	
4	Mr. Anand Mulye	Omkar Industries, Vadodara	
5	Mr. Kiran P. Kulkarni	Garware Institute, UM-GICED	
6	Mr. Anil Rastogi	Garware Institute UM-GICED	
7	Dr. Shivram S. Garje	University of Mumbai	
8	Dr. Ravi Prakash Dongre	Technical Institute Pune	
9	Dr. Subhash C. Srivastava	HBTI, Kanpur	
10	Mr. Mandar Damle	Kansai Nerolac Paints Ltd, Mumbai	

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science

Appendix B

Justification for M.Sc. (Paint Technology)

1.	Necessity for starting the course	The University of Mumbai's Garware Institute of Career Education & Development plans to introduce two years Full time M.Sc. Paint Technology. Paint technology course in Mumbai imparts adequate knowledge and develops the skill requirements to meet the demands of the industry and trains the students in theory and practical to fit in well and perform in an excellent manner. It also gives them exposure to manufacturing, quality control systems and modes of application. It Groom the students to take up executive and Supervisory roles.
2.	Whether the UGC has recommended the course:	Yes, UGC has recommended the course as per gazette no. DL(N)-04/0007/2003-05 dated 11th July 2014. UGC encourages the incorporation of skill oriented and value-added courses to develop skilled manpower.
3.	Whether all the courses have commenced from the academic year 2023-2024	Yes, it would be commencing from the Academic year 2023-24 as per NEP 2020. However, the course has been launched in the year 2017-18.
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available?	Yes, this course is self-financed. The expert visiting faculty from industries come to teach this course.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	The duration of the course is Two years (Four Semester). It cannot be further compressed.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	The intake capacity of this course is 60 Students. The admission procedure is still ongoing.
7.	Opportunities of Employability/ Employment available after undertaking these courses:	The demand of Paint Technologists exists in manufacturing, application, quality control and techno-commercial aspects in various industries viz., paint, resins, pigments and allied industries, furniture, automobile, plastic, ship building, and printing inks as well.It is also possible to become an entrepreneur or a painting contractor.

Dr. Keyurkumar M. Nayak,
Director,
UM-GICED

Prof. (Dr.) Shivram S. Garje
Dean, Faculty of Science