

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### PRINTER'S SCIENCE (Course Code: 3335802)

Diploma Programs in which this course is offered	Semester in which offered
Printing Technology	3 <sup>rd</sup> Semester

### 1. RATIONALE

It is necessary to have scientific knowledge of substrates used in the printing industry in order to select right type of substrate for the print job. Theoretical knowledge of chemicals used in making of printing inks and other raw materials is also important. Furthermore, understanding of multi-colour print reproduction requires the knowledge/understanding of printing science.

### 2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency

- **Select appropriate raw materials based on their physical and chemical properties for the various print jobs/printing processes.**

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Student Activity; P -Practical; C – Credit;; ESE -End Semester Examination; PA - Progressive Assessment.

#### 4. DETAILED COURSE CONTENTS

Unit	Major Outcomes (Course outcomes in cognitive domain according to NBA Terminology)	Learning (Course)	Topics and Sub-topics
<b>Unit – 1 Substrates</b>	1a. Describe various types of substrates used in the printing industry		1.1 Paper 1.2 Board 1.3 Metal 1.4 Ceramic 1.5 Plastics 1.6 Polymers 1.7 Photosensitive materials
	1b. Define the Properties and applications of various Substrates		1.2 .1 Properties of each substrates 1.2.2 Applications of each substrates
<b>Unit– 2 Rubber</b>	2a. Differentiate the manufacturing process of Rubber Rollers and Synthetic rubber blankets		2.1 Rubber Roll Manufacturing 2.2 Rubber blanket Manufacturing
<b>Unit– 3 Paper</b>	3a. Describe the raw materials for Paper Manufacturing process		2.3 Materials for Paper manufacturing (i) Raw material for Pulp manufacturing (ii) Raw material for Sizing (iii) Raw material for Filling (iv) Raw material for Coating
	3b. Explain the Paper Manufacturing Process		2.4 Paper Manufacturing Process (i) Pulp manufacturing (ii) Mechanical Process (iii) Chemical Process (iv) Mechanical & Chemical Process (v) Beating (vi) Sizing (vii) Coating
	3c. Describe the operation of Paper Manufacturing Machine		2.5 Paper Manufacturing Machine (i) Machine Sections and Design (ii) Water mark (iii) Wire mark (iv) Calendaring (v) Surface Coating, Sizing
	3d. Explain the and chemical Physical Characteristics of various types of Paper/substrates		2.6 Physical Characteristics of Paper (i) Physical strength (ii) Formation (iii) Smoothness (iv) Compressibility (v) Porosity (vi) Opacity (vii) Surface strength

Unit	Major Outcomes (Course outcomes in cognitive domain according to NBA Terminology)	Learning Topics and Sub-topics
		(viii) Ink receptivity (ix) Moisture Content (x) Dimensional stability (xi) Grain Direction (xii) Color and Brightness (xiii) pH Content (Acidity and Alkalinity) (xiv) Uniformity
<b>Unit– 4 Ink</b>	4a. Explain various Ingredients required in the Ink manufacturing process	4.1 Ingredients of Ink (i) Pigments (ii) Vehicles (iii) Resins (iv) Solvents (v) Plasticizers (vi) Driers (vii) Additives (viii) Characteristics of each constituent
	4b. Compare working characteristics of various types of Ink Manufacturing Machines	4.2 Ink Manufacturing Machine (i) Three Roll Mill (ii) Ball Machine (iii) Mixing and Milling (iv) Manufacturing of Paste and Liquid Ink
	4c. Identify the application of various Types of Inks used for the various types of printing processes	4.3 Various types of Ink (i) Letterpress Ink (ii) Lithographic Ink/Offset/Cold set/Heat set Ink (iii) Liquid Ink – Gravure/Flexography (iv) Inkjet / Digital Ink (v) Specialized Ink
	4d. Identify Characteristics of Inks for various print processes	4.4 Characteristics of Ink (i) Flow Properties (ii) Press stability (iii) Drying characteristics (iv) Lithographic Performance (v) Printability (vi) Ink thickness
	4e. Differentiate various Drying methods of printing Inks	4.5 Drying methods of Ink (i) Oxidation (ii) Evaporation (iii) Absorption (iv) Precipitation (v) IR /UV drying / Heat set

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Substrates	08	08	02	04	14
2.	Rubber Roll and Blanket	06	02	02	06	10
3.	Paper	16	10	04	12	26
4.	Ink	12	06	04	10	20
	<b>Total</b>	<b>42</b>	<b>26</b>	<b>12</b>	<b>32</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## 6. SUGGESTED LIST OF PRACTICAL/EXERCISES:

**Not Applicable**

## 7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

- i. Students are required to engage independently for an on-line or off-line search/learning activity to describe the various types of paper manufacturing processes and machines required.
- ii. Prepare a poster of flow chart, which describes the paper manufacturing process.
- iii. Present the final project to the class by demonstrating the knowledge of paper manufacturing process.

## 8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Collect samples of raw materials for classroom demonstration.
- ii. Show video clips on raw material, paper manufacturing process.

## 9. SUGGESTED LEARNING RESOURCES

### A. List of Books:

Sr. No.	Author	Title of Books	Publication
1	Materials in Printing Processes	L. C. Young	Focal Press, London
2	Printing Science	F. Pitman, L. C. Young	Pitman, London
3	Printing Basic Science	Charles C.	Perganon Press, Oxford, London
4	What Lithographer should know about Paper	R. F. Raio	GATF Pittsburg
5	What Lithographer should know about Ink	R. F. Raio	GATF Pittsburg
6	The Science of Physics in	Er. Win Joffe	GATF Pittsburg

<b>Sr. No.</b>	<b>Author</b>	<b>Title of Books</b>	<b>Publication</b>
	Lithography		
7	Lithographer's Manual	Charles Shapiro	GATF Pittsburg
8	Graphics Art Manual	Janet N. Field	Arno Bess N. P. Corporation, London
9	Materials in Printing Technology	Janet N. Field	All India Federation of Master Printers, New Delhi

**B. List of Major Equipment/ Instrument**

Computer System with Internet, LCD Projector with Screen

**C. List of Software/Learning Websites**

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE**

**Faculty Members from Polytechnics**

- **Prof. B. A. Patel**, HOD Printing Technology, R C technical Institute Ahmedabad
- **Prof. B L Patel** Lecturer in Printing Technology, R C technical Institute Ahmedabad

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Dr. Nishith Dubey**, Professor, Department of Vocational and Entrepreneurship Education
- **Dr. Haji Naik Dharavath**, Associate Professor, Department of Vocational and Entrepreneurship Education