

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: GRAVURE PRINTING PROCESS
(COURSE CODE: 3355806)**

Diploma Programs in which this course is offered	Semester in which offered
Printing Technology	5 th Semester

1. RATIONALE

In the era of packaging, knowledge of Gravure printing process is necessary and need to be learned. The advancements in Gravure technology is the best in Package Printing. The motive of this subject is to enhance the knowledge and skill level in Gravure Printing Process area to strengthen the present practices.

2. LIST OF COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

- **Demonstrate printing through Gravure printing**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Describe Gravure process.
- Explain various Configurations for printing on Gravure machine.
- Appreciate different modern advancements and new techniques for Gravure printing industry.
- Select proper ink for Gravure Printing in Packaging Industry.
- Identify problems and suggest remedies in Gravure Printing.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

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

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I Introduction of Gravure Printing Process.	1a. Describe Gravure process. 1b. List Advantages and Disadvantages of Gravure Printing Process. 1c. Differentiate between Gravure and other process. 1d. Describe need for special colors and variables in Image Processing for Gravure Process 1e. Explain role of Gravure in Packaging Industry.	1.1 Meaning and Brief idea of Gravure Process. 1.2 Advantages and Disadvantages of Gravure Printing Process. 1.3 Comparison with other Printing process. 1.4 Image Processing for Gravure Process- Original, Films, Need for special colors and variables. 1.5 Role of Gravure in Packaging Industry.
Unit– II Cylinder Materials and Variables	2a. Explain Electroplating process and importance of chemical and electrical variables- electrolytes, immersion, current, voltage, temperature, distance. 2b. Describe Cylinder materials - Copper , Chromium , Nickel with their properties- finishing, cutting, removal and plating degreasing, polishing, testing, corrections. 2c. Explain automation and environmental aspects in Electroplating process. 2d. Describe cylinder correction methods	2.1 Electroplating – Chemical and electrical variables such as electrolytes, immersion, current, voltage, temperature, distance. 2.2 Copper- Properties, Finishing, Cutting, Removal, Testing, Corrections, Nickel Plating. 2.3 Chromium – Plating, finishing, degreasing, polishing, testing, corrections. 2.4 Cylinder Base- sleeve, integral shaft, Balancing methods 2.5 Cylinder correction methods 2.6 Different material used in cylinder making with their property and its purpose. 2.7 Automation and Environmental aspects.
Unit– III Engraving Methods	3a. Discriminate between Cylinder preparation methods in engraving for - its process, merits and demerits 3b. Select appropriate Cylinder constructions like , Screen angles, cell size, cell walls, and cylinder sizes, engraving speed, cutting Tool, Ink and substrate considerations screen angles etc.	3.1 Chemical Engraving – Cell Configurations, different Etching Process, merits and demerits 3.2 Carbon Tissue Method – Process, merits and demerits 3.3 Electronic engraving – Process, merits and demerits 3.4 Electronic beam or laser engraving process 3.5 Screen angles, cell size, cell walls, and cylinder sizes, engraving speed, cutting Tool, Ink and substrate considerations.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– IV Substrates	4a. Explain different substrates used and problems occurring due to particular substrates	4.1 Properties of different substrates used in process. 4.2 Types absorbent or non absorbent 4.3 Applications 4.4 Static electricity problems. 4.5 Problems occurring in different substrates with their remedies.
Unit– V Doctor blade	5a Describe doctor blade assembly- angle, force, deflection, causes of wear, and materials. 5b Compute doctor blade settings. 5c List the materials used for doctor blade 5d State the parameters for holder configurations . 5e Describe the importance of holder configurations in usage.	5.1 Assembly- angle, force, deflection, causes of wear 5.2 Materials used for doctor blade 5.3 Holder configurations, wiping and contact angles, pressure control. 5.4 Setting, make ready and lubrication. 5.5 Problems
Unit - VI Impression Roller	6a. Describe Impression Rollers 6b. Explain Impression Rollers Function, hardness, pressure, balance, conductivity, setting procedure, its storage and electrostatic assist. 6c. List the materials used in Impression Roller compare their properties hardness, conductivity.	6.1 Functions of Impression roller. 6.2 Materials used and its hardness, conductivity. 6.3 configurations – pressure setting, balance, Deflection and compensation. 6.4 Setting and effects on web tension. 6.5 Storage of Rollers 6.6 Electrostatic assist. 6.7 Problems and their remedies
Unit – VII Inks for Gravure	7a. Select suitable Gravure inks. 7b. Recover gravure ink 7c. Describe environmental control in gravure press room	7.1 Ink ingredients and its composition. 7.2 Ink classification. 7.3 Properties of Gravure ink. 7.4 Solvents, Toxicity, Viscosity, Temperature 7.5 Ink fountain and Transfer 7.6 Solvents recovery systems. 7.7 Environmental control in Gravure press room
Unit – VIII Issues related to Gravure Printing	8a. Identify problems occurring in Gravure print and troubleshoot them. 8b. Describe Registration control of gravure print. 8c. Describe gravure proofing system	8.1 Problems and their causes with remedies. 8.2 Identification of Gravure print. 8.3 Storage of Cylinders and rollers. 8.4 Gravure proofing system. 8.5 Registration control

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 2.5 Hours)			
			R Level	U Level	A Level	Total
I	Introduction of Gravure Printing Process.	10	0	4	4	08
II	Cylinder Materials and Variables	10	2	2	4	08
III	Engraving Methods	04	0	2	4	06
IV	Substrates	06	2	4	4	10
V	Doctor blade	04	2	4	4	10
VI	Impression Roller	06	0	4	4	08
VII	Inks for Gravure	06	2	4	4	10
VIII	Issues related to Gravure Printing	10	2	4	4	10
	Total	56	10	28	32	70

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.

7. SUGGESTED LIST OF PRACTICALS:

The practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the competencies.

Following is the list of practical exercises for guidance.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain

Sr. No.	Unit No.	Practical / Exercises (Outcomes in psychomotor domain)	Hrs. Required
01	01	Work with different parts of Gravure machine	04
02	04	Set feeding unit	06
03	04 05 06 08	Set Printing unit Set Doctor blade Set impression roller Registration control	06
04	04	Set Delivery unit	02
05	03 03 03 03 03	Prepare Gravure cylinder Demonstrate Chemical engraving Demonstrate Electronic engraving Demonstrate Electric and laser beam engraving Make Cylinder correction	06
06	08	Perform printing on Gravure cylinder proofing machine.	04
		Total Hrs	28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

- i. Industrial visits of Gravure printing process.
- ii. Interact with owner and list common troubles in Gravure printing.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Arrange industrial visits to gravure printing units and demonstrate machine settings, inks, and troubleshooting.
- ii. Motivate students to use internet and collect name, addresses, catalogues, rates, specifications of manufacturers of gravure printing machines and equipment.

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

S. No.	Title of Books	Author	Publication
1	Hand book of Printmedia	Helmut Kipphan	Springler (ISBN 3-540-67326-1)
2	Gravure Process Technology		GAA.
3	Gravure Primer		GATF

B. List of Major Equipment/ Instrument.

- i. Gravure Printing Machine with consumables
- ii. Chemical Engraving Machine with consumables
- iii. Electronic Engraving Machine with consumables

C. List of Software/Learning Websites.

- i. www.sudwaren.com/gravure-printing-machine.htm

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE.

Faculty Members from Polytechnics

- Prof. B. I. Patel, I/C Head of Department of Printing Technology, RCTI, Ahmedabad.
- Prof. S. D. Gohel, Lecturer in Printing Technology, RCTI, Ahmedabad.

Coordinator and Faculty Members from NITTTR Bhopal

- Dr. Nishith Dubey, Professor, Department of Vocational Education and Entrepreneurship Development.
- Prof. Joshua Earnest, Professor, Department of Electrical and Electronics Engineering