GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
I – Semester

CourseTitle: **Fundamentals of Printing**
(Course Code: 4315801)

Diploma programme in which this course is offered	Semester in which offered
Printing Technology	First

1. RATIONALE

This course apprises with various printing processes, their classification, physical and chemical properties of processes. Student will be acquainted with various printing processes. The course also provides skills of pre-press, press & post-press sequences, ink, paper and other printing substrates.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Select Printing Techniques to be used for given print product.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

a) Identify various printing techniques.
b) Select relevant Conventional Printing Process for a print job.
c) Select different Digital Printing Process for a print job.
d) Sequence pre-press, press and post press workflow.
e) Select required substrates and inks for printing
f) Dispose printing waste safely.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
4	-	0	4	30*	70	00	00	100

(*):Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

***Legends:** **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** -End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	Not applicable		
	Total		

Note

*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

*ii. The following are some **sample** 'Process' and 'Product' related skills(more may be added/deleted depending on the course)that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency..*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	Not applicable	
Total		

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
	Not applicable	

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. More could be added to fulfill the development of this course competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Follow safety practices.
d) Practice good Housekeeping.
e) Practice environmental friendly methods and processes.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit – I **Introduc-tion to Printing**	1a. Explain the evolution of Printing 1b. Differentiate between various Printing Processes 1c. Describe different stages of Printing Cycle. 1d. Describe structure and purpose of each level of printing. 1e. Compare the kind of services provided by printing firms.	1.1 Historical background of printing 1.2 Movable, wooden and metal type printing- invention 1.3 Printing processes- basics, workflow 1.4 Size and scope of printing industry 1.5 Structure of printing industry 1.6 Organization of printing services
Unit – II **Conven-tional printing**	1a. Identify image and non-image area of conventional printing processes 1b. Distinguish physical and chemical properties of printing processes. 1c. Explain working principle of conventional printing processes 1d. Identify requirements of the given conventional printing processes. 1e. Select appropriate conventional printing process for a given print job.	1.1 Conventional printing process- Physical and chemical properties, Working principle, Identification of image area & non-image area, basics process, importance, advantages and disadvantages, 1.2 Study of various printing processes with the help of printed samples. 1.3 Applications of conventional printing processes.
Unit – III **Digital printing**	2a. Identify image and non-image area of digital printing processes. 2b. Describe working principle of various digital printing processes. 2c. Explain variable data printing in digital printing processes. 2d. Identify requirements of the given digital printing process. 2e. Justify the selection of relevant digital printing process for the given print job.	2.1. Working principle of different digital printing processes. 2.2. Identification of image area & non-image area. 2.3. Concept of Variable Data Printing 2.4. Basics of digital process for printing 2.5. Digital printing process and their samples. 2.6. Importance of each Digital Printing Process. 2.7. Advantages & disadvantages of each printing process. 2.8. Application of Digital Printing Process
Unit– IV **Pre-Press, Press, and Post Press Activities**	3a. Explain workflow of printing 3b. Explain typography, and graphic Design 3c. Describe the post - press processes. 3d. Justify the selection of relevant typography and graphic design for the given print job	3.1 Typography, Graphic Design and process photography 3.2 Binding and finishing processes. 3.3 Converting Processes and Packaging Processes.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit– V **Inks and Substrates**	4a. Identify ingredients of printing Ink 4b. Distinguish between different types of inks. 4c. Justify the selection of paper & other substrates for a given printing job.	4.1 Ingredients of Ink. 4.2 Printing ink drying system. 4.3 Types of paper and boards. 4.4 Standard paper sizes. 4.5 Other substrates for printing.
Unit– VI **Handling Print Waste**	5a. Explain importance of disposing print waste for sustainability. 5b. Describe different methods of disposing print waste. 5c. Suggest methods of handling print waste with examples. 5d. Select waste disposal method for the given printing process.	5.1 Print waste-concept. 5.2 Sustainability aspect of print waste 5.3 Print waste handling- Methods and disposal

***Note**:The UOs need to be formulated at the 'Application Level' and above of Revised Bloom's Taxonomy' to accelerate the attainment of the COs and the competency.*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Introduction to Printing	14	4	4	2	10
II	Conventional Printing	20	6	6	4	16
III	Digital Printing	08	2	4	4	10
IV	Pre-Press, Press, and Post Press Activities	12	4	4	6	14
V	Inks and Substrates	06	2	4	4	10
VI	Handling Print Waste	04	2	4	4	10
Total		**64**	**20**	**26**	**24**	**70**

***Legends:** R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

***Note**: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare specification of Printing and allied machineries for different printing processes.
b) Collect specifications, prices, terms and conditions along with sources of supply and prepare report on types of substrates used to replace non-recyclable substrates.
c) Prepare list of national and regional printing companies covering providing services to different sectors.
d) Prepare list of major paper manufactures along with details of their products.
e) Prepare list of major Ink manufactures along with details of their products.
f) Collect samples with specifications and related details of different finishing process.
g) Prepare a collage of different entrepreneurship opportunities in printing industry.
h) Prepare a flowchart of different operation done in printing press.
i) Prepare a hierarchy chart of one print organization.
j) Give a seminar on any printing relevant topic.
k) Undertake a market survey of different printing process and prepare a report.
l) Prepare showcase portfolios of different printed samples.
m) Collect different image carrier and prepare a report.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.11***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on addressing environmental and sustainability issues.
g) Guide students for using data manuals.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the microproject should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Collect 5 samples printed by Offset Printing Process and prepare a report.
b) Collect 5 samples printed by Gravure Printing Process and prepare a report.
c) Collect 5 samples printed by Flexography Printing Process and prepare a report.
d) Collect 5 samples printed by Screen Printing Process and prepare a report.
e) Collect samples of different binding styles and prepare report on it.
f) Prepare a short report on Indian Printing Industry.
g) Visit Offset Press and prepare their product portfolio.
h) Visit Gravure Press and prepare their product portfolio.
i) Visit Flexography Press and prepare their product portfolio.
j) Visit Screen Printing Unit and prepare their product portfolio.
k) Collect samples with different finishing effects like Coating, Lamination, Embossing, Die-cutting etc. and prepare a report.
l) Collect samples of different types of substrates and prepare catalogue.
m) Collect information of different inks and paper manufacturer.
n) Collect report of handling print waste with figures, tables and comparative charts and strategies used. Compile as a report.
o) Collect information of environment friendly packaging recommendations. Make a presentation
p) Collect information of Go Green concept in Printing Industry. Prepare an article.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Handbook of Print Media	Helmut Kipphan Ed.	Heidelberg Druckmaschinen AG, Springer Heidelberg, Published in 2001 ISBN 978-3-540-29900-4
2	The Print and Production Manual	Sean Smyth	Pira International Limited, Randalls Road, Leatherhead, Published in 2008, ISBN-13 : 978-1858025148
3	Introduction to Printing	Herbert Simon	Publisher: Faber and Faber, Published in 1963, ISBN-13 : 978-0571084081
4	Graphic Design and Print Production Fundamentals	Graphic Communications Open Textbook Collective	PUBLISHER: BCcampus, PUBLICATION DATE: November 12, 2015, Print ISBN: 978-1-989623-66-4
5	The Complete Book on Printing Technology	NIIR Board	Publisher: Asia Pacific Business Press Inc. (1 January 2003) ISBN-13 : 978-8178330525
6	Printing Technology 5th Edition	J. Michael Adams	Publisher: Delmar Cengage Learning Publication date: 12 July 2001, ISBN-13: 978-0766822320

14. SOFTWARE/LEARNING WEBSITES

a) https://www.youtube.com/watch?v=RW1HJdW5XLs
b) https://www.youtube.com/watch?v=5LMU-zB8Sro
c) https://www.youtube.com/watch?v=IDGJkAKFnGI
d) https://www.youtube.com/watch?v=PYtd9PtkYbs
e) https://www.youtube.com/watch?v=WB0HnXcW8qQ
f) https://www.youtube.com/watch?v=hTF_fgpWoTo
g) https://www.youtube.com/watch?v=CcSsM772_l8
h) https://www.youtube.com/watch?v=pNZb7CXUjs0
i) https://www.youtube.com/watch?v=h1bt3pom_MQ
j) https://www.youtube.com/watch?v=diH2fv288bQ
k) https://www.youtube.com/watch?v=nUXDltQfqSA
l) https://www.prepressure.com/
m) https://guides.library.illinois.edu/
n) https://en.wikipedia.org/wiki/Printing
o) https://www.youtube.com/watch?v=LB fEeO6no
p) http://agpcptech.weebly.com/
q) https://www.youtube.com/watch?v=TAO4mlYnxCw
r) http://printwiki.org/

15. PO-COMPETENCY-CO MAPPING

Semester I	Fundamentals of Printing (Course Code: 4315801)									
	POs and PSOs									
Competency & Course Outcomes	**PO 1 Basic & Discipline specific knowledge**	**PO 2 Problem Analysis**	**PO 3 Design/ development of solutions**	**PO 4 Engineering Tools, Experimentation &Testing**	**PO 5 Engineering practices for society, sustain-ability & environment**	**PO 6 Project Manage-ment**	**PO 7 Life-long learning**	**PSO 1** Design and develop the product and process for the need of the industries and society.	**PSO 2** Analyze and improve productivity, quality and cost effectiveness for the various pre-press, press and post press process involved in printing to meet the industries requirement.	**PSO 3** (If needed)
Competency ***Select Printing Techniques to be used for given print product***	3	-	-	-	2	-	2	-	2	
Course Outcomes CO a) Identify various printing techniques	3	-	-	-	-	-	2	-	1	
CO b) Select relevant Conventional Printing Process for a print job.	3	-	-	-	-	-	2	-	2	
CO c) Select different Digital Printing Process for a print job.	3	-	-	-	2	-	2	-	2	

CO d)Select pre-press, press and post press workflow.	3	-	2	-	-	-	2	-	2	
CO e)Select required substrates and inks for printing	3	-	1	-	2	-	2	-	2	
CO f) Dispose printing waste safely.	2	-	-	-	3		2	-	-	

Legend: '**3'** for high, '**2**' for medium, **'1'** for low and **'-'** for no correlation of each CO with PO/PSO.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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NITTTR Resource Persons

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