

**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**

**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**

Semester -III

**Course Title: Offset Printing Process**

(Course Code: 4335804)

Diploma programmes in which this course is offered	Semester in which offered
Printing Technology	Third

**1. RATIONALE**

In Printing Industry, Offset Printing is still the leading technology of all the printing processes. To acquire knowledge of this course student must have information about offset principle and image carrier generation. This course will impart an extensive knowledge of all the elements of printing operation and functions of the offset process. Machine configurations, machine units of sheet fed machine, registration methods, ancillary operations and controlling point problems and troubleshooting etc. are the main elements of this course which will enable the student to handle all the necessary operations and equipment related to the offset printing machines. It gives information about print production work flow during inline operations.

**2. COMPETENCY**

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

- **Perform printing operations on offset printing machine for desired output**

**3. COURSE OUTCOMES (COs)**

The practical exercises, the underpinning knowledge, and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

- Choose sheet fed offset machine configuration for given job
- Set feeder unit of offset machine according to substrate
- Set dampening unit of offset machine according to job
- Set inking unit of offset machine according to job
- Operate Printing and Delivery mechanism for required output
- Troubleshoot different issues arising during printing

**4. TEACHING AND EXAMINATION SCHEME**

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	CA	ESE	CA	ESE	
3	-	4	5	30*	70	25	25	150

(\*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate the integration of Cos, and the remaining 20 marks is the average of 2 tests to be taken during the semester for 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. Some of the PrOs marked “\*” (in approx. Hrs column) are compulsory, as they are crucial for that particular CO at the ‘Precision Level’ of Dave’s Taxonomy related to ‘Psychomotor Domain’.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Print single color job using litho stone	I	02
2	Identify and elaborate working of different parts of sheet fed machine	I	02
3	Identify and elaborate working of different configuration of offset sheet fed machine	I	02
4	Draw workflow of for perfecting sequence of printing operation for given job	I	02
5	Perform feeding unit settings for printing on paper on sheet fed machine	II	02
6	Perform feeding unit settings for printing on board on sheet fed machine	II	02
7	Check pH, conductivity and TDS of dampening solution.	III	02
8	Check dampening roller setting of offset machine	III	02
9	Prepare fresh dampening solution batch with given fountain solution	III	02
10	Perform Inking unit settings according to construction of units on sheet fed machine	IV	02
11	Check ink roller setting of offset machine	IV	02
12	Cleaning of inking and Dampening unit	IV	02
13	Perform plate mounting operation on sheet fed machine	V	02
14	Perform blanket changeover operation on sheet fed machine	V	02
15	Perform side lay and front lay settings according to construction of units on sheet fed machine	V	
16	Perform delivery unit setting of sheet fed offset machine	V	02
17	Demonstrate functions of transfer drum used for both side printing in single pass on sheet fed machine	V	02
18	Perform roller cleaning, blanket cleaning and plate cleaning operation with press consumable chemicals	V	02
19	Print single color job on map litho paper with sheet fed machine	V	02
20	Print two color job on map litho paper with sheet fed machine	V	02
21	Print four color job on art paper with sheet fed machine	V	02
22	Demonstrate functions of metal decoration press used for printing	V	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	on metal sheet on sheet fed machine		
23	Perform sheet fed machine calibration	VI	02
24	Perform maintenance schedule for sheet fed machine	VI	02
25	Perform inspection schedule of sheet fed machine	VI	02
26	Resolve problems occur during printing on sheet fed machine	VI	02
27	Measure opacity and density of given printing ink samples.	VI	02
28	Perform draw down test on CMYK inks	VI	02
<b>Minimum 28 Practical Exercises</b>			<b>56 Hrs.</b>

**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 %
1	Use of tools, instruments and equipments	20
2	Print substrate	20
3	Cleanliness	10
3	Safety measure follow	10
3	Able to answer the questions	20
4	Individual work and working in groups	10
5	Submission of assigned work	10
<b>Total</b>		<b>100</b>

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

This 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.
1	<b>Single color offset machine</b> Maximum Paper Size : 380 x 508 mm Minimum Paper Size : 125 x 175 mm Maximum Printing Area : 357 x 485 mm Paper Thickness : 30 to 300 gsm Blanket : 4 ply rubber blanket, 1.9 mm thick gripper margin on Paper : 8 to 10 mm gripper margin on Plate : 32 mm (1.25") Gripper Bite : 4 mm plate thickness : 0.05 to 0.2 mm direct offset master thickness : 100 micron Inking unit : 9 rollers including 2 oscillators, 2 form rollers Dampening unit : 4 rollers including 1 oscillator, 1 form roller	2 to 28

S. No.	Equipment Name with Broad Specifications	PrO. No.
	Main drive motor : 1 Hp 230 V AC three phase (connectable to single phase power supply) Compressor pump motor : 1 Hp 230 V AC single phase Speed : 1500 to 5000 iph Physical Dimensions (L x W x H) : 1420 x 1165 x 1300 mm Gross Weight : 1250 Kg approx. (packed)	
2	<b>Four color offset machine</b> Maximum paper size : 460x640mm Minimum paper size : 240x280mm Maximum Printing Area : 445x636mm Paper thickness : 40 GSM to 400 GSM Blanket : 4 ply rubber blanket, 570x645 1.7mm mm thick gripper Margin on paper : 5 to 8 mm Gripper margin on plate : 32 mm (1.25") Gripper bite : 9 mm Plate size: 510x645 Plate thickness : 0.30 mm Inking unit : 20 rollers including 3 form rollers Dampening unit : 5 rollers including Main drive motor : 3 phase D.C. 415 V, 50 Hz Speed : 2000 to 10000 IPH Physical dimensions (L x W x H) : 2900x2030/4600x2160mm1650mm Gross Weight : 6500 Kg approx. (packed)	2 to 28
3	<b>Litho stone</b>	1
4	<b>Ink proofing kit</b> Tape width: 20-40 mm Usage: drawdown Model: manual Printing width : 50 mm Printing length: 110 mm Roll diameter: 35 mm Roll length : 50 mm	28
5	<b>Pressroom tools</b> – plate punch, blanket clamp, tool box	1 to 28
6	<b>Printer</b> Laser jet black and white, print resolution: 600 x 600 DPI, print speed: 24 PPM, print size: A3, A4	15,16,17
7	<b>Fuser</b> Size: A3 Model: semi-automatic Material: metal Weight: 110 Kg	15,16,17

S. No.	Equipment Name with Broad Specifications	PrO. No.
8	<b>Vernier Caliper</b> Range: 0-100 mm Depth Bar: 1.9 mm Max. permissible error E MPE: $\pm 0.05$ mm Max. permissible error S MPE: $\pm 0.07$ mm Mass: app. 128g With upper locking screw: Yes	9,13,14
9	<b>Micrometer Screw Gauge</b> Range: 0-1 Inch Accuracy: $\pm 0.0001$ Inch Mass: app. 175g	9,13,14
10	<b>Durometer – Rubber Hardness Series A</b> Type: handheld dial durometer Range: 10 to 90 Dial reading: 10-90 Indenter shape: blunt taper Depth: 1.3 in Height: 7.4 in Width: 2.3 in Tip Angle: 35 degrees ASTM D 2240, DIN 53 505, ISO 7619, ISO868, JIS K 6253, JIS K 7215	9,13,14

## 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 competency.

- a) Work as a leader/a team member.
- b) Follow safety practices
- c) Practice Good housekeeping
- d) Follow ethical practices
- e) Realize the importance of green energy.

The ADOs are best developed through 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 1<sup>st</sup> year
- ii. 'Organization Level' in 2<sup>nd</sup> year.
- iii. 'Characterization Level' in 3<sup>rd</sup> year.

## 8. UNDERPINNING THEORY

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

Unit	Unit Outcomes (Uos) (4 to 6 Uos at different levels)	Topics and Sub-topics
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<b>Unit – I</b> <b>Sheet fed offset machine</b>	1a. Explain principle of offset machine 1b. Understand different types of machine configurations 1c. Compare offset process with other printing process 1d. State advantages and limitation of offset process 1e. Select the relevant type of configuration according to job	1.1 Lithographic offset – working principle, Invention and history of offset machine. 1.2 Development of offset machine 1.3 Construction of sheet fed offset press 1.4 Categories of sheet fed press 1.5 Advantages and limitations of offset machine 1.6 Applications of offset machine, 1.7 Comparison with other printing processes, 1.8 Configurations of sheetfed machines: single color, multi color, perfecting press, satellite press, CIC
<b>Unit– II</b> <b>Feeding unit</b>	2a. Explain function of feeder 2b. Understand feeder cycle 2c. Identify types of feeding unit 2d. Identify different feeder components 2e. Select appropriate settings of feeding unit according to substrate	2.1 Function of feeder 2.2 Feeder cycle 2.3 Feeder types – manual feeder, automatic feeder, single sheet feeder and stream feeder, continuous feeder, friction feeder, pneumatic feeder 2.4 Working components of feeding unit – pile height governor, Pile board, feed board (Ram board), sheet separation, sheet lifting, sheet forwarding, conveying board, sheet control mechanism on feed board, sheet register, two sheet detector, no sheet detector, front / back separation, sheet insertion and transfer, side lay and types, front lay, gripper
<b>Unit - III</b> <b>Dampening unit</b>	3a. Explain working of dampening system 3b. Identify different ingredients of dampening system 3c. Control parameter of fountain solution 3d. Select appropriate settings of dampening according to job 3e. State function of different rollers used in dampening system 3f. Chose roller covering material for dampening system 3g. Identify different dampening system used for offset process	3.1 Characteristics of dampening system 3.2 Image and non image area of plate 3.3 Retention of plate relative selectivity 3.4 Fountain solution: water, acid, wetting agents or surfactants, plate conditioners, gum Arabic, 3.5 Parameter for fountain solution: pH, conductivity, hardness of water, 3.6 Role of alcohol, factor affecting the amount of fountain solution 3.7 Construction and working of dampening system 3.8 Rollers in dampening system: form roller, pan roller, doctor roller,

	3h. Perform care and maintenance of dampening system	vibrator roller, 3.9 Covering of dampening roller: stockiniette cloth, molleton cloth, paper covering, synthetic covering, 3.10 Setting of roller, desensitizing the metal roller 3.11 Types of dampening system – Conventional, direct and indirect dampening system, continuous dampening system, the dampen orr system, brush system, flapper system, air mist system, dahlgren system, micro flow system, alcohol system, inker feed. 3.12 Care and maintenance of dampening system
<b>Unit– IV Inking unit</b>	4a. State the function of inking system 4b. Explain different parts of offset inking system 4c. Identify different types of inking system used in offset printing process 4d. State the function of different rollers used in inking system 4e. Differentiate between different inking system 4f. Plan maintenance and care of inking system	4.1 Role and functions of inking system, theory of ink flow and factors affecting it, ink-water balance, 4.2 Parts of inking system: fountain section – fountain blade, ink keys, ink agitator, split duct, fountain roller, doctor roller, distribution section – vibrator, distributors, riders, form roller section – form roller, hickie pickers, form roller setting 4.3 Inking system – central drum system, multiroll inking system, underneath inking system, drum inking system 4.4 Different inking rollers: synthetic rubber rollers, polyurethane rollers, davis process rollers, natural rubber rollers, vulcanized oil rollers, PVC rollers, 4.5 Care and maintenance of inking system, shore hardness, working and types, required properties and storage conditions, ink film thickness
<b>Unit– V Printing unit</b>	5a. State the importance of plate cylinder in offset printing unit 5b. State the function of blanket cylinder 5c. Select appropriate blanket according to job 5d. Set the packing and pressure of	5.1 Plate cylinder: bolting clamp, cam clamp, detachable clamp, cylinder gears, cylinder gears, cylinder gap 5.2 Blanket cylinder: bearers, bearer pressure, undercut 5.3 Blanket types, construction of blanket, characteristics of blanket,

	<p>plate and blanket cylinder</p> <p>5e. Set different parameter of delivery system.</p> <p>5f. Operate printing unit with appropriate print settings</p>	<p>features of blanket, blanket selection, packing, storage and handling,</p> <p>5.4 Impression cylinder: cylinder packing, patching, image enlargement, image reduction, printing pressure, cylinder setting theory, cylinder balancing, bearer to bearer adjustment</p> <p>5.5 Transfer cylinder, sheet transfer, sheet delivery, short and extended carriers, sheet control devices, anti set off spray powder</p>
<p><b>Unit– VI Troubles hooting</b></p>	<p>6.1 Troubleshoot problems occur due to plate</p> <p>6.2 Troubleshoot problems occur due to blanket</p> <p>6.3 Troubleshoot problems occur due to machine setting</p> <p>6.4 Troubleshoot problems occur due to dampening solution</p> <p>6.5 Troubleshoot problems occur due to paper</p> <p>6.6 Troubleshoot problems occur due to ink</p>	<p>6.1 Catching up, color too weak, dot gain, fading, grey and weak solids muddy half tones, plate blinding, plate wear, scumming, double image, trapping</p> <p>6.2 Embossing, misregister, mottle, piling, plate wear, slurring, double image,</p> <p>6.3 Dot gain, distribution, ink water balance, misting, misregister, mottle, muddy halftones, picking or linting, piling, plate wear, roller stripping, slurring, double image, tinting or toning,</p> <p>6.4 Catching up, chalking, color too weak, color variation, dot gain, drying, gloss, grey and week solids, ink water balance, mottle, muddy halftones, picking or linting, plate blinding, roller stripping, rub off or scuffing, scumming, tinting, toning,</p> <p>6.5 Chalking, color variation, drying, ghosting, gloss, hickies, mileage, misregister, mottle, picking or linting, piling, rub off or scuffing, double image, tinting or toning,</p> <p>6.6 Backing, blocking, catching up, chalking, color too weak, color variation, crystallization, dot gain, distribution, drying, embossing, fading, ghosting, gloss, grey and weak solids, hickies, ink water balance, mileage, misting, misregister, mottle, muddy half</p>

		tones, picking or linting, piling, plate blinding, roller stripping, rub off or scuffing, scumming, set off or blocking, tinting or tonning, trapping
<b>Unit – VII Sustainable development in offset printing</b>	7a. Explain Sustainable development in offset machine 7b. Explain Ink wash up system and hazardous content 7c. Define green fountain solution and ink 7d. Use of solar system or renewable sources.	7.1 Different sustainable development in offset industry like reduced power consumption, newly developed drying system, less wastage, short make ready time, less man power, increase productivity, 7.2 Ink wash up system and its disposal 7.3 Green fountain solution and ink 7.4 Renewable resources in printing press

## 9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Sheet fed offset machine	4	2	4	2	8
II	Feeding unit	8	6	6	4	16
III	Dampening Unit	6	3	3	2	8
IV	Inking unit	6	3	3	2	8
V	Printing unit	8	4	4	6	14
VI	Troubleshooting	6	4	2	4	10
VII	Sustainable development in offset printing	4	4	2	0	6
<b>Total</b>		<b>42</b>	<b>26</b>	<b>24</b>	<b>20</b>	<b>70</b>

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

**Note:** This specification table provides general guidelines to assist students in 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 vary slightly from above table.

## 10. SUGGESTED STUDENT ACTIVITIES

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

- Prepare journals based on practical performed in laboratory
- Give seminar on relevant topic
- Undertake micro projects

- d) Market survey for innovative ideas
- e) Collect specimen of different substrates and inks
- f) Prepare catalogue for different specimen printed by offset process
- g) Collect defected specimen and show various defect and find our causes for it
- a) Visit press setups in local area to learn workflow of commercial job production
- b) Visit press setups in local area to learn workflow of news paper production
- h) Visit press setups in local area to learn workflow of publication job production

### 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/subtopics.
- 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.10**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- f) Guide students on how to address issues on the environment and sustainability.
- g) Guide students for using type manuals, color charts, Pantone books.

### 12. SUGGESTED MICRO-PROJECTS

**Only one micro-project** is planned to be undertaken by a student that needs to be assigned to him/her at the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, 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 a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The duration of the micro-project should be about **14-16 (fourteen to sixteen) student engagement hours** during the course. The students 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 the information of various Offset machines setup installed in Local area/ City
- b) Enlist various software used for job imposition and give details of workflow of software.
- c) Collect product samples from different stages of procedure of printed product
- d) Enlist all the equipment used on Production floor along with photograph and parallel terminology used by local workers.

- e) Collect information about quality standard followed in local press setups and prepare report.
- f) Collect information about latest software and machines used for offset production job handling
- g) Enlist raw material used in printing press along with costing and procurement process.
- h) Collect production workflow samples of publication job produced in local area bindery
- i) Prepare a report on rollers used in offset printing process with its material
- j) Collect samples of different consumables used in sheet fed offset machine and prepare report on it
- k) Collect information of different blanket manufacturer with their products and prepare report on it
- l) Collect information of inks manufacturer unit and their product for offset printing also prepare report
- m) Collect brochure of different offset machine manufacturer and compare their specification.
- n) Collect information on different parts supplier of offset machine and check availability and rate of different parts
- o) Collect data of five different offset machine and compare their features
- p) Collect information machine applicable to packing industry and prepare report
- q) Collect information on machine applicable to commercial jobs and prepare report
- r) Collect the information on green printing and write a report
- s) Collect information regarding environment friendly inks and prepare report
- t) Collect information regarding waste disposal generated by offset printing process.

### 13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with the place, year, and ISBN
1	Print and Production Manual	Michael Barnard	Pira International, United Kingdom ISBN 1 85802 238 X
2	Handbook of Print Media	Prof. Dr.-Ing. habil. Helmut Kipphan	Springer-Verlag Berlin Heidelberg New York, ISBN3-540-67326-1
3	Litho Offset Press Operating	Charles W Latham	Graphic Arts Technical Foundation; Revised edition (1967) ASIN - B0007FKTSQ
4	Sheetfed Offset Press Operating	Lloyd P. Dejidas, Thomas M. Destree	Graphic Arts Technical Fndtn; 2nd edition (June 1, 1995), ISBN- 13: 978-0883621714
5	Web Offset Press Operating	Daniel G. Wilson	Graphic Arts Technical Fndtn; 5 edition (March 10, 2003), ISBN- 13: 978-0883622902
6	Solving Sheetfed Offset Press Problems	Gatf (Author)	Graphic Arts Technical Fndtn; 3 Edition (1994), ISBN-13: 978- 0883621677
7	The GAFT Guide to	Peter Oresick	Printing Industries Pr; Spi edition (1

S. No.	Title of Book	Author	Publication with the place, year, and ISBN
	Troubleshooting for The Web Offset Press		November 2003), ISBN-13: 978-0883624678

#### 14. SOFTWARE/LEARNING WEBSITES

- <https://www.youtube.com/watch?v=RW1HJdW5XLs> : introduction to sheet fed machine
- <https://www.youtube.com/watch?v=pNZb7CXUjs0> : working of offset machine
- [https://www.youtube.com/watch?v=uzHhrXFv9\\_o](https://www.youtube.com/watch?v=uzHhrXFv9_o) : operating of sheet fed machine
- <https://www.youtube.com/watch?v=ILuYMI2Xer0> : roller setting
- <https://www.youtube.com/watch?v=9T2q7eDXwJs> : printing operation and density checking
- <https://www.youtube.com/watch?v=DGW5Ya9Z2AE>: perfecting operation
- <https://www.youtube.com/watch?v=mB7t1mUndFQ>: feeding section
- <https://www.youtube.com/watch?v=GMVmQe2EVkM> : plate mounting
- <https://www.youtube.com/watch?v=R09fp9kB71A>: machine installation
- <https://www.youtube.com/watch?v=lbzK-kB0HTQ>: delivery setting

#### 15. PO-COMPETENCY-CO MAPPING

Semester I	Text Generation (Course Code: 4325801)						
	POs						
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, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
<u>Competency</u>	Perform printing operations on offset printing machine for desired output						
<u>Course Outcomes</u>							
a) Choose sheet fed offset machine configuration for given job	3	2	3	2	2	2	2
b) Set feeder unit of offset	3	2	3	2	2	2	-

machine according to substrate							
c) Set dampening unit of offset machine according to job	3	2	3	2	2	2	-
d) Set inking unit of offset machine according to job	3	2	3	2	2	2	-
e) Operate Printing and Delivery mechanism for required output	3	2	3	2	2	2	-
f) Troubleshoot different issues arising during printing	3	3	3	3	2	2	-

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

**16. COURSE CURRICULUM DEVELOPMENT COMMITTEE****GTU Resource Persons**

<b>S. No.</b>	<b>Name and Designation</b>	<b>Institute</b>	<b>Contact No.</b>	<b>Email</b>
1	S. D. Gohel	R. C. Technical Institute, Sola, Ahmedabad	8460609775	sandy_printmedia@yahoo.com
2	V. B. Patel	R. C. Technical Institute, Sola, Ahmedabad	9825219434	vinita_printing@yahoo.com
3	D. D. Raval	R. C. Technical Institute, Sola, Ahmedabad	9879551606	ravaldevang9@gmail.com