GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Printing Technology

Subject Code: DI04058011

Subject Name: Total Quality Control

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Basic knowledge of Pre press, Press and Post press.
Rationale:	This course deals with quality control methods in printing industry. To understand this course student must have knowledge about printing processes, image generation, printing machine functions and operations. In this course student will acquire the knowledge about quality control tool, equipment, methodology used for quality control. Greater emphasis is laid to understanding the Fundamentals of quality, quality control aids, Management system and Quality standards. For process calibration and standardization of printing process the knowledge of this course is essential.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify Quality control stages	R, A, E
02	Use quality control aids effectively	R, A, E
03	Interpret requirements of standards used in printing	R, A, E
04	Apply Quality management systems in printing	R, A, E

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit – I Fundamentals of Quality	1.1 Understand quality 1.2 Quality control Process 1.3 Concept of Quality, Quality Cost, Quality Inspection 1.4 Describe Concept of Quality Assurance and Quality Control 1.5 Stages of Quality Control	09	20
Unit – II Quality Control Aids	2.1 Quality control Parameters – Density, Dot Gain, Contrast, Trapping, Delta-E, Grey Balance 2.2 Quality Control Tool – Color Control Bar, Slur Mark, Star target, Dot Area patches, Test Forms. 2.3 Color Control patches & Print Control Strips	09	20
Unit – III Quality Control Standards	3.1 ISO Standards for Printing – 12647 3.2 Benefits of working with ISO 12647 3.3 Press Calibration to ISO 12647 3.4 Implementation process of ISO standards in Printing Organization. 3.5 Purpose and application area of SWOP. 3.6 Purpose and application area of GRACOL	10	25
Unit– IV Quality Management Systems	4.1 Basic elements of Quality Management. 4.2 Methodologies of Six Sigma 4.3 Purpose and application area of "5S". 4.4 The key benefits of Six Sigma and 5S. 4.5 G7 methodology in Printing Industry.	09	20
Unit– V Quality Management Systems	5.1 Understand fundamentals of statistical quality control Draw control charts and its application for printing industry. 5.2 Material Inspection, Control chart for variables, attributes – X-R chart, P chart, process capability, simple numerical	08	15
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
21	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
34	59	20	NA	NA	NA

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Production Planning and Control, Jhamb L.C., Everest Publishing House, ISBN: 9788186314722
2. Quality Control Handbook, Juran, McGraw-Hill Inc., US (1 January 1989), ISBN-13: 978-0071005104
3. Statistical Quality Control: A Modern Introduction, 6th edition, DC Montgomery, Wiley Publications ISBN-10: 8126525061, ISBN-13: 978-8126525065
4. Print and Production Manual, Michael Barnard, Pira International, United Kingdom ISBN 1 85802 238
5. Six sigma handbook, Pyzdek, McGraw-Hill Inc., US, ISBN-10: 9789339221775, ISBN-13: 978-9339221775
6. Total Quality Management, Sayankar Vinod, Everest Publishing House, ISBN-10: 8176602671, ISBN-13: 978-8176602679

(b) Open-source software and website:

1. https://www.youtube.com/watch?v=HSigIEs3B3k
2. https://www.youtube.com/watch?v=kEngca8RvCg
3. https://www.youtube.com/watch?v=hQJyXpDKKBg
4. https://www.youtube.com/watch?v=_r9ZUp4N-Ac
5. https://www.youtube.com/watch?v=9WHYXIiLFnE
6. https://www.youtube.com/watch?v=d3PxymtsGAQ
7. https://www.youtube.com/watch?v=5KJ7MdUlIGM
8. https://www.youtube.com/watch?v=oLKq-gmHsV0
9. https://www.youtube.com/watch?v=gL01qR0vVUQ

Suggested Course Practical List:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Measure Density of CMYK patches of given print, printed by Offset, Digital and Screen-Printing Process.	I	02
2	Measure Density of CMYK patches printed in Color Control Bar on given offset print	III	02
3	Calculate Trapping of RGB Patches printed in Color Control Bar on given offset print	III	02
4	Calculate Color Deviation (Delta E) on given print using Spectrophotometer	III	02
5	Measure Density of CMYK patches printed in Color Control Bar on given offset print	III	02
6	Prepare Specification chart of parameters recommended by SWOP and measure on News paper	III	02
7	Prepare Specification chart of parameters recommended by GRACoL and measure on 4 color Offset Print	III	02
8	Prepare ISO -12647 recommendation & specification for Offset and Screen Printing	VI	04
9	Understand G7 methodology and prepare report for Offset printing process	VI	06
10	Understand 5S methodology and prepare report for Implementation in Large Scale Printing Press	III	06
11	Understand Six Sigma methodology and prepare report for waste minimisation on 4 color sheet fed offset Press	VI	06
12	Testing of Grey balance using different viewing Conditions (Light booth or Viewing booth)	VI	02
13	Finding the pH/Conductivity of the dampening solution.	II	02
14	Measuring Gray Balance using color control strip.	II	02
15	Determining the print contrast and tonal value of the given sample	II	04
16	Testing of paper grain direction for the paper sample.	I	04
17	Testing of CMYK Inks using draw down test method.	II	04
18	Resistance test of CMYK Inks.	II	04
	Minimum 14 Practical Exercises		**30 Hrs.**

Suggested Project List: -

1. Collect the information of various quality control methods used in Local area/ City
2. Enlist various software used for the quality control and give details of workflow of software.
3. Collect Product samples having defects and quality issues
4. Enlist all the equipment used in Quality checking room along with photograph and parallel terminology used by local workers.
5. Collect information about Quality Standard followed in Local Press setups.
6. Collect information about latest software and machines used for Quality check on inline process
7. Collect production workflow samples of jobs produced in local area press
8. Collect production workflow samples of jobs having different ancillary operations
9. Collect production workflow samples of jobs having different online operation.
10. Compile report on various Quality control tools used in industry.

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications	PrO.No.
1	Eye Glass - min 10x magnification	1 to 5
2	Spectrophotometer - The instrument should measure both reflected and transmitted colour as well as transmission haze and meet CIE, ASTM and USP guidelines for accurate colour measurement. Tristimulus colour calculations are performed from 360 nm to 780 nm Two reflectance measurement areas Automated UV calibration and control Measurement principle: dual-beam spectrophotometer Wavelength resolution: <2 nm Effective bandwidth: 10 nm equivalent triangular Reporting interval: 10 nm Photometric range: 0 to 150% Photometric resolution: 0.003 % Automatic UV control: 400 nm cut off filter for UV control and UV exclusion Measurement time: <5 seconds Colorimetric repeatability: < 0.03 ΔE* CIE L*a*b* on white tile in LAV	1 to 5

S. No.	Equipment Name with Broad Specifications	PrO.No.
	and SAV modes (20 readings range) < 0.05 ΔE* CIE L*a*b* on blue denim tile in LAV and SAV modes Spectral repeatability: Max 0.20 peak-to-peak between 435 and 695 nm Interface: RS-232C serial, 19,200 baud, DB9 (female) terminal Operating environment: 10° to 40°C , 10 % to 90 % RH, non-condensing The instrument should come with software for easy data retrieval and statistical computation • Accessories: calibrated instrument white tile, certificate of traceability, black calibration light trap, transmittance zero calibration plate, green diagnostic tile, Wavelength diagnostic filter, reflectance sample clamp, LAV and SAV apertures and other accessories	
3	**Zahn cup and ford cup viscometer** **Zahn Cup:** ASTM D 816, ASTM D 1084,and ASM D 4212 Volume of cup: 44 ml Length of handle: 40 ±0.1 mm Height of cup: 58 ±0.1 mm Measurement of temperature: 25°C ±1.0 °C Material: stainless steel Calibration: certificate included **Ford Cup, as per ASTM D1200** Diameter orifice: 2.1mm – 5.8mm viscosity range: 10 – 1200 cSt flow times: 30-100 sec Supplied with a certificate of conformity Sheen 406/1, 406/2, 406/3, 406/4 & 406/5 equivalent	17,18
4	Stroboscope - Flash light, blinking control	3,5,6,9,12
5	Ink proofing kit 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	17,18

Suggested Activities for Students:

Students should perform 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 may be useful for their placement interviews:

1. Prepare journals based on practical performed in laboratory.
2. Give seminar on relevant topic.
3. Undertake micro-projects.
4. Visit Press setups in Local area to observe quality control used during production
5. Visit Press setups in Local area to observe quality control used during commercial production
6. Visit Press setups in Local area to observe quality control used during Publication job production

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