



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Printing Technology

Course / Subject Code : DI03058061

Course / Subject Name : Digital Printing

w. e. f. Academic Year:	2024-25
Semester:	3 <sup>rd</sup>
Category of the Course:	PCC

<b>Prerequisite:</b>	Basic knowledge of conventional and digital printing process.
<b>Rationale:</b>	Digital Printing course is aimed at introducing and providing learner with knowledge and practice of latest advancements in non-impact printing technologies. This course also helps learner with to understand evolving segments of technologies in digital printing arena. The advancements in digital technology have lead to revolution in printing and new technology integration is taking place in printing industry. The purpose of this course is to enhance the knowledge and skill level of students in different digital technologies so that students can choose appropriate technology depending upon the nature of work and can make the optimum use of it to improve the quality of printing and reduce the cost.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify the application area of the digital printing process.	R, U, A
02	Select digital printing techniques as per the job requirement.	R, U, A
03	Suggest tools and material required for a given product.	R, U, A
04	Operate equipment and machines in the digital printing department.	R, U, A
05	Identify the output requirements for given product.	R, U, A
06	Analysis of printed product output.	R, U, A

\*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
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA(M)	PA(I)	ESE (V)	
3	0	0	3	70	30	00	00	100



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## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit – I Introduction of Non Impact Printing Technology	1.1 Definition, application, and factors that accelerated the use and development of digital printing technologies. 1.2 Comparative study of conventional & digital printing technology. 1.3 Advantage, limitation of digital printing techniques. 1.4 Workflow of various digital printing processes 1.5 Sustainable development in digital printing, various factors that affect sustainability,	06	14
Unit – II Computer to Press	2.1 Direct imaging presses - Principle, types, and Press configurations. comparative study of computer-to-film, computer-to-plate, and computer to print 2.2 Classification of digital printing techniques. 2.3 Print-On-Demand (POD), variable data printing (VDP), distribute-and-print, remote publishing (Web2Print), and customization 2.4 Eco friendly development in computer to press technology,	06	18
Unit – III Toner based Digital Printing system	3.1 Electrophotography working principle, stages, characteristics, types of the photoconductor, construction of OPC drum, functions of charge generation material and charge transport material 3.2 Photo-mechanics behind latent image formation in electrophotography. 3.3 Types, requirements and the general composition of dry and liquid toner. 3.4 Principle, working, advantages, limitation, and application of ion deposition, electrostatic and magnetographic toner-based digital printing system 3.5 Eco friendly toners, imaging, advanced technology for sustainable development, newer drying systems,	10	22
Unit– IV Ink Jet and Thermal Transfer Digital	4.1 Inkjet technology- principle, classification, press configuration, ink types. 4.2 Thermal transfer- principle, classification, press configuration, ink types. 4.3 Substrate & ink used for inkjet and thermal transfer digital printing system, 4.4 Comparative study of electrophotography and inkjet digital printing technologies.	10	22



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Printing systems.	4.5 Troubles and remedies related to digital printing processes, 4.6 Eco friendly inks, substrates, different features that comes under sustainable development		
Unit– V Hardware, Software & digital proofing	5.1 Inkjet technology- principle, classification, press configuration, ink types. 5.2 Thermal transfer- principle, classification, press configuration, ink types. 5.3 Substrate & ink used for inkjet and thermal transfer digital printing system, 5.4 Comparative study of electrophotography and inkjet digital printing technologies. 5.5 Troubles and remedies related to digital printing processes, 5.6 Eco friendly inks, substrates, different features that comes under sustainable development	7	14
Unit– VI Digital Printing Press, Application and Advances	6.1 Wide format printer- construction, classification, working, application, & technical specifications of a general wide format printer. 6.2 Monochrome & multicolor laser printer – working, advantages, application and limitation. 6.3 Monochrome & multicolor inkjet printer – working, advantages, application & limitation. 6.4 Print solution through the integration of prepress, press and post press.	6	10
	<b>Total</b>	<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
27	53	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. Handbook of Print Media - Helmut Kipphan Ed. - Heidelberg Druckmaschinen AG, Springer Heidelberg, Published in 2001 - ISBN 978-3-540-29900-4
2. The Digital Print: Preparing Images in Light room and Photoshop for Printing - Jeff Schew - Peachpit Press, United states of America ISBN-13: 978-0-321-90845-2



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3. Print and Production Manual - Michael Barnard - Pira International, United Kingdom - ISBN 1 85802 238
4. Handbook of Industrial Inkjet Printing - Dr. Werner Zapka - WILEY-VCH, Verlag GmbH & co, ISBN-978-3-527-33832-0
5. Digital Printing Pocket Primer - Frank J. Romano - Windsor Professional Information, LLC ISBN:1-893190-01-3
6. Environmental Performance of Digital Printing - Pentti Viluksela, Merja Kariniemi & Minna Nors - VTT Technical Research Centre of Finland. ISBN 978-951-38-7630-2

**(b) Open source software and website:**

1. <https://www.youtube.com/watch?v=JEVurb1uVFA> – different types of non impact printers
2. <https://www.youtube.com/watch?v=EwvmNv1leUo> – Electrophotographic Printing Process
3. <https://www.youtube.com/watch?v=gEBPwRCpqBE> – different digital printing technology
4. <https://www.youtube.com/watch?v=9yeZSaigBj4> – Thermal ink jet printing
5. <https://www.youtube.com/watch?v=TSGfitxlkzI> – piezojet inkjet process
6. <https://www.youtube.com/watch?v=VzEPjyISZjI> – electrostatic inkjet process
7. <https://www.youtube.com/watch?v=99Jz2JFmp1c> – continuous inkjet printing
8. <https://www.youtube.com/watch?v=IvvPka0Xd3I> – sublimation transfer
9. <https://www.youtube.com/watch?v=GZEnnBKFUTQ> – wide format inkjet process
10. [https://www.youtube.com/watch?v=IXh\\_1U1unyk](https://www.youtube.com/watch?v=IXh_1U1unyk) – digital proofing systems
11. <http://agpcptech.weebly.com/> - lecture notes
12. <http://printwiki.org/> - glossary

**Suggested Course Practical List:**

1. NA

**Suggested Project List: -**

- a. Collect the information of photoconductor manufacturer and list the material used for photoconductor material and write a report
- b. Enlist photocopy machine manufacturer along with technical specifications.
- c. Identify the working condition required for a digital print setup and prepare a report by viewing the relevant video/industrial visit.
- d. Collect a minimum of 10 printed samples of Print-On-Demand (POD), variable data printing (VDP). Submit a comparative report on it.
- e. Enlist the chemicals used in the digital printing press and write report on it.
- f. Collect information about quality standard followed in the digital printing press and prepare report on it.
- g. Survey safety norms followed at digital printing press also prepare a report on it



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- h. Visit the local digital press, identify the substrate and ink used for digital printing techniques and prepare sample book of substrate and ink.
- i. Visit the digital press and observe the workflow of any one type of product and prepare report
- j. Prepare a test chart. Perform printing operation with any two substrates by using an inkjet printer and submit your observations for image test elements.
- k. Prepare a test chart. Perform printing operation with any two types of printer and submit your observations for image test elements.
- l. Survey wide format printer manufacturing companies and write a report.
- m. List the unit cost of substrate and write a report.
- n. Collect information of handling print waste with figures, tables and comparative charts and strategies used. Compile as a report.
- o. Collect information of environment friendly inks available for digital printing process also prepare report on it.
- p. Collect information of sustainable features given in different non impact printing process and write report on it

## **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. Give seminar on relevant topic.
2. Collect minimum 10 technical specifications of a computer to film, computer to plate and computer to print technology.
3. Collect minimum 05 printed samples of Ion deposition, electrostatic and magnetographic printing process.
4. Visit digital press setups in local area to learn the workflow of signage production.
5. Visit the thermal transfer printer setup and identify the applications of thermal transfer printing.
6. Visit tonner refilling shop in the local area and observe the process.
7. Visit wide format press setup in the local area to observe workflow of wide format printer performed on printed jobs.
8. Attend the installation and maintenance workshop of digital printer hardware. Prepare a flowchart of different operation done in printing press.
9. Prepare a hierarchy chart of one print organization.
10. Give a seminar on any printing relevant topic.
11. Undertake a market survey of different printing process and prepare a report.
12. Prepare showcase portfolios of different printed samples.
13. Collect different image carrier and prepare a report.

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