SCHEME & SYLLABUS

B. TECH.
(PRINTING TECHNOLOGY)
w.e.f. 2018-2019 Session

CREDIT BASED SYSTEM

Guru Jambheshwar University of Science and Technology
Hisar - 125001
(Haryana)
(Established by State Legislature Act 17 of 1995)
'A' GRADE NAAC ACCREDITED UNIVERSITY

Syllabus for Printing Technology

2nd Year (3rd Sem.)

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY HISAR
ज्ञान विज्ञान सहितम्

APPLIED SCIENCES FOR PRINTING

General Course Information	
Course Code: BSC-PTG201-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Describe comprehensive knowledge of science in printing arena.	L1
CO 2	Classify technical parameters of printing materials	L2
CO 3	Apply knowledge of press room environment in printing organization	L3
CO 5	Select suitable instrument for maintaining print standard.	H2

UNIT-I

Understanding Colour: Fundamental of colours, Light, Source of Colour, Primary Colours, Secondary Colours, Additive Colours, Subtractive Colour, Spectral Transmission Curves. Introduction to Colour Measurement.

Surface Chemistry - Surface tension, Contact angles, Capillary Action, Interfacial Tension, Hydrophobic & Hydrophilic, Water and Ink Interaction, Emulsification of Ink. Role of Emulsification in Printing. Viscosity. Importance of viscosity in printing.

Effect of light in printing and Packaging - Effect of light on different film and plate coating, Adhesives & Ink-films, Light fastness, Print Characteristics, effect of light on different poly films / Substrates.

UNIT-II

Role of pH and Conductivity in Printing– Definition of pH, Method of determining pH, Importance of pH in Printing & Packaging, pH of paper & Ink, role of pH control in printing & packaging applications. Conductivity, Fountain Solution & Conductivity, Define conductivity? Need of conductivity measuring conductivity, Application of Conductivity in Printing.

Impact of Environmental Condition in Printing and Packaging: Humidity – Definition, Relative Humidity, Measurement, Control by air conditioning, Role of Relative Humidity in Printing & Packaging,

Effect of Relative Humidity in packaging operations. Green Printing, VOC gases, its impacts, Use of chemicals in Printing and its environmental impact.

UNIT-III

Optics & Optical Instruments- Reflection, Transmission, Importance of observer angle in viewing print, Optical illusion in viewing colour, Opacity, Density, Visual Angle, Angular Magnification, Magnifying Glass, Microscopes, safe Light Condition, Introduction to Photographic Cameras and Contact printer, Introduction to Densitometer and Spectro-densitometer. Measuring color, International standards for color evaluation, Delta E and its importance.

Colloids in printing & Packaging - Introduction, Kinds, Properties, Absorption and adsorption, Selective Adsorption, Application in printing and packaging.

Fountain Solution -Introduction, Composition and functions. Role of fountain solution in Printing.

UNIT-IV

Chemistry of Photography & Light Sensitive Materials - Introduction to photo-chemistry, Light Sensitive Material, Types of LSM, Constituents of LSM, Properties. Diazo compounds and its role in image creations.

Polymers and Printing: Monomer, Polymer, Types of Plastics – Thermo-sets & Thermoplastics. Introduction to Natural Polymers, Cellulose Derivatives, Synthetic Polymers, Polythene, Polypropylene, Polyvinyl Plastics.

Text & Reference Books:

1. **Optics** by Brij Lal and Subrahmaniam
2. **Optics** by Ajay Ghatak
3. **Engineering Chemistry** by Jain and Jain
4. **Science and Technology of Printing Material** by Parkash Shetty.
5. **Hand Book of Print Media** – by H. Kippan

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	--	--	--	--	--	--	--	--	1	1	2	2	--
CO2	2	2	--	--	2	--	--	--	1	3	--	--	2	1	--
CO3	1	1	--	--	1	--	--	--	2	--	--	--	2	2	--
CO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	2	2	1	--	3	--	--	--	--	--	1	1	2	3	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

ENGINEERING SCIENCE FOR PACKAGING

General Course Information	
Course Code:ESC-PTG201-T **Course Credit:**3 **Contact Hours:**3/week, (L-T-P:3-0-0) **Mode:** Lectures and Tutorials **Examination Duration:** 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To define various raw materials used in printing and packaging industry	L1
CO 2	To describe the utilization of paper, inks and other chemicals in printing and packaging industry	L2
CO 3	To apply principles of engineering and sciences in the field of printing and packaging industry	L3
CO 4	To examine most inclusive areas where various materials can be used in printing and packaging industry	H1

UNIT-I

Metals for Plate-making, Printing &Packaging:

Types and characteristics of metal used for type alloys, foundry type, & Hot metal composition. Physical and Chemical properties metals used in printing & packaging industry in relation to printing & packaging application, Lithographic properties of Metals.

Photographic Materials:

Main kinds of films and photographic papers used in graphic organization, Cross section of films, Main-base, Stripping, Anti halation Coating, Protective Coating, Paper positive materials, Developers, Reducers, and Intensifiers.Light sensitive materials for printing image carrier for major printing processes.

UNIT-II

Paper Substrates & Non-Paper Substrate for Printing &Packaging:

Paper and Non- Paper Substrate used for printing and packaging industry.Types of Plastic Substrate – Polyethylene, Polypropylene, Polyvinyl Chloride (PVC), Polyethylene tera-phthalate (PET), Polyester, Polystyrene, Cellophane, Metal, Foils, Laminates.

Printing Inks, Coatings & Varnishes for Printing & Packaging Applications:

Ingredients used in Printing Inks, Coatings and Varnishes. Colorant – Dyes, Pigment, Vehicles, Additives, Binders, Types of printing Inks – Paste Inks, Liquid Inks, Letter Press Inks, Offset/ Lithographic Inks, Gravure Inks, Flexo-graphic Inks. Constituents of coating & varnishes. Application, advantages and limitations of coatings & Varnishes.

UNIT-III

Cushioning Materials:

Cushioning materials, Solid vs Loose fill, Foam-in-place, Cushion curves and design, Corrugated as a cushioning material, Economics of design - packaging costs vs. product damage.

Adhesives for Printing &Packaging:

Adhesion, Types of Adhesive – Animal Glues, Fish Glues, Casin Adhesives, Starch Based Adhesives, and Natural resin Adhesives, Cellulose Adhesives, Rubber based adhesives, Synthetic resin adhesives, Inorganic Adhesives, Hot Melt.

UNIT-IV

Miscellaneous Materials:

Different types of rubber used in printing, Book binding Materials – Leather, Cloth, Rexene, Threads, Tapes, Stitching Wire, Covering Materials, Varnishes, Laminates Eye-lets, thermoform.

Text & Reference Books:

1. Printing Materials: Bob Tompson
2. Printing Materials: Prakash Sethi
3. Printing Materials: LC Young
4. Materials in Printing Processes
5. Printing Ink Manual
6. Hand Book of Packaging Technology: Walter Saroka

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: ESC-PTG201-T **Course Title:** Engineering Science for Packaging

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
Course Outcome (CO)	CO 1	3	3	1	1	3	2	-	1	1	1	1	1	3	3	1	
	CO 2	3	3	3	2	3	2	1	1	1	1	1	1	3	3	1	
	CO 3	3	3	2	1	3	2	1	1	1	1	1	1	3	3	1	
	CO 4	3	3	2	2	2	2	2	1	1	1	1	1	3	3	2	

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PRE – PRESS TECHNOLOGY

General Course Information	
Course Code:PCC-PTG201-T **Course Credit:** 3 **Contact Hours:** 3/week, (L-T-P:3-0-0) **Mode:** Lectures and Tutorials **Examination Duration:** 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To label and draw various hardware and software components of computer	L1
CO 2	To explain the utilization of various displays for pre-press technology	L2
CO 3	To apply principles of DTP in the field of pre-press technology	L3
CO 4	To compare various types of images used in pre-press	H1
CO 5	To select and evaluate areas where computer can be used in printing	H2

UNIT – I

Basic of computers – understanding, working, diagram outline, Introduction to Hardware and Software, Operating systems. Device Interfaces, Basic input/output system, Memory – Primary & Secondary Memory, Types RAM, DRAM, SRAM, ROM, PROM, EPROM.Magnetic tape, Optical disk, Cache memory.

UNIT – II

Display devices – CRT displays (Types, Working, Advantages, and Disadvantages), LED, LCD, Display adapter - CGA, VGA, SVGA, Magnetic bubble memory, Charged couple device, Image compression and its types, Mass Storage Technology – data organization, FD, HD, SCSI, Compact Disc.

UNIT – III

Working of different Input /Output devices - Keyboard, Optical & Rolling Ballmouses, Printers (daisy wheel dot matrix, ink jet, laser), VDT's & its types, Plotters, Digitizers (Digitizing the sketch), Electronic Typewriters, Light Pens, Web Camera, Joysticks,Optical Scanner (OCR, BCR, MICR)Electronic Image, File Formats - BMP, TIFF, GIF, JPEG & others file format.

UNIT – IV

Introduction to Desk TopPublishing, Uses in Printing Technology, Usage of Computers in Printing. Importance of DTP in Pre – Press Section, Introduction to DTP software, Word Processing Phenomenon. Story editing & formatting, Manipulation of graphics, importing graphics, Colour editing, Table preparation & background setting,Cost estimation of DTP.

Text & Reference Books:

1. Hardware Bible: Winn IL RochTechmedia.
2. Desk Top Typography: Quark X Press
3. Page Maker 6.0: BPB Publication.
4. Printing in a Digital World – David Bergsland
5. Introduction to Prepress - Hugh Speirs
6. Computer Technology – Sinha&Sinha

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Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC-PTG201-T **Course Title:** Pre-Press Technology

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Outcome (CO)	CO 1	2	1	1	1	3	1	1	1	3	2	3	3	3	3	2
	CO 2	2	2	1	2	3	2	1	2	3	3	2	3	3	3	2
	CO 3	2	3	3	2	3	2	1	1	3	2	3	3	3	3	1
	CO 4	3	3	3	2	3	2	1	1	3	2	2	3	1	3	3
	CO 5	2	3	2	3	3	2	2	2	3	2	3	3	3	3	3

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PRE – PRESS TECHNOLOGY LAB.

General Course Information	
Course Code: PCC- PTG201-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To draw various hardware and software components of computer	L1
CO 2	To explain the utilization of various hardware devices for pre-press technology	L2
CO 3	To apply practical implications of DTP in the field of pre-press technology	L3
CO 4	To compare various types of images used in pre-press	H1
CO 5	To select and evaluate areas where computer can be used in printing	H2

List of Experiments

1. Basics of Computer Terminologies.
2. Hardware devices & their uses.
3. Word-Processing & editing Software.
4. DTP and its applications.
5. DTP Software used in Pre - Press.
6. Page set-up with different sizes, margins & orientations.
7. Making of Text enriched documents.
8. Basics of Scanners & their uses.

9. Working of Printers & their output quality.

10. Image and Text Integration.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC- PTG201-P **Course Title:** Pre-Press Technology Lab

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Outcome (CO)	CO 1	2	2	2	3	3	1	3	1	3	2	3	3	3	3	2
	CO 2	2	1	2	3	3	1	1	1	3	2	3	3	3	3	2
	CO 3	2	2	1	2	3	2	1	2	3	3	2	3	3	3	2
	CO 4	2	2	2	2	3	3	1	1	3	2	3	3	3	3	1
	CO 5	3	3	2	2	3	2	1	1	3	2	2	3	1	3	3

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INTRODUCTION TO PRINTING PROCESSES

General Course Information	
Course Code: PCC- PTG203-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To define printing and its applications	L1
CO 2	To describe various printing processes	L2
CO 3	To interpret merits and demerits of printing processes	L3
CO 4	To distinguish image carriers of various printing processes	H1

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UNIT-1

Evolution of Printing and Letter Press Printing: Brief history of Printing in the World. Brief Introduction of Printing Industry in India, Scope and total Printing capacity. Letterpress printing process: Introduction, application, schematic diagram, advantages and disadvantages, basic principle and recent trends in letterpress printing. Types of Letterpress printing process

UNIT-II

Offset Printing Process: types of offset printing process - sheet-fed and web-fed offset printing, Introduction, application, schematic diagram, advantages and disadvantages, basic principle and recent trends in offset printing.

UNIT-III

Flexography and Gravure Printing Process: Introduction, application, schematic diagram, advantages and disadvantages, basic principle and recent trends in Flexography printing.

Gravure printing process: Introduction, application, schematic diagram, advantages and disadvantages, basic principle and recent trends in Gravure printing.

UNIT-IV

Screen and Digital Printing Process: Introduction, application, schematic diagram, advantages and disadvantages, basic principle and recent trends in screen printing. Introduction to digital printing, its advantages, disadvantages, applications, Common printing faults in various printing processes, their causes and remedies

Text & Reference Books:

1. Letter Press Printing Part 1, 2, By C.S. Misra
2. Printing Technology by Adams, Faux, Rieber, 5th edition
3. Handbook of Print Media, H. Kippan, Springer
4. Lithographers Manual
5. Printing Technology 5edition – by Adams.

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Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC- PTG203-T **Course Title:** Introduction to Printing Processes

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
Course Outcome (CO)	CO 1	3	3	1	1	3	2	-	1	1	1	1	1	3	3	1	
	CO 2	3	3	3	2	3	2	1	1	1	1	1	1	3	3	1	
	CO 3	3	3	2	1	3	2	1	1	1	1	1	1	3	3	1	
	CO 4	3	3	2	2	2	2	2	1	1	1	1	1	3	3	2	

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INTRODUCTION TO PRINTING PROCESSES LAB

General Course Information	
Course Code: PCC-PTG203-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)**
	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

List of Experiments

1. Study of Letterpress Printing Process.
2. Study of different letter press Printing Machines.
3. Study of Flexography Printing Process.
4. Study of Gravure Printing Process.
5. Study of Offset Printing Process.
6. Study of Screen-Printing Process.
7. Study of various types of image carriers for different Printing processes.
8. Overview of pre-make-ready and make-ready operations.
9. Study of Running & Printing faults on various Printing processes.
10. Study of various kind of rollers used in printing.

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Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC- PTG203-P **Course Title:** Introduction to Printing Processes Lab

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
Course Outcome (CO)	CO 1	3	3	1	1	3	2	-	1	1	1	1	1	3	3	1	
	CO 2	3	3	3	2	3	2	1	1	1	1	1	1	3	3	1	
	CO 3	3	3	2	1	3	2	1	1	1	1	1	1	3	3	1	
	CO 4	3	3	2	2	2	2	2	1	1	1	1	1	3	3	2	

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GRAPHIC DESIGN IN PRINTING

General Course Information	
Course Code: PCC-PTG205-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to :	RBT Level
CO 1	Describe printing design concept	L1
CO 2	Recognize colour importance in printing	L2
CO 3	Use different graphics/package design softwares	L3
CO 6	Design numerousperspective drawings	H3

UNIT-I

INTRODUCTION TO GRAPHIC DESIGN: Introduction to design, introduction to Graphic Design, Introduction to Printer's design, Concept of Graphic Arts, Concept of Graphic Communications, Understanding steps involve in Graphic Communications and Making the Print work. **FUNDAMENTALS OF DESIGN:** Point, Line, Shape, Tone, value, weight, texture, size, space, etc. **PRINCIPLES OF DESIGN**: Balances, Proportion, Rhythm, Unity, Contrast, Simplicity, Fitness.

UNIT-II

COLOURS IN PACKAGE DESIGN: Introduction of Colour, function of Colour, Physical Dimension of Colour, Responses to Colour, emotional effects of colour. Colour Combination - Colour schemes, Dimension of colour, colour symbolism, Colour Theory- Additive theory, Subtractive theory. Division of Design -Natural, Conventional, Decorative, Geometrical and abstract.

TYPOGRAPHY : Typography -Structure Design and Function, Introduction to 2D & 3D Types, Physical structure of type, type measurement, Introduction to Digital Types, Post Script Fonts, True Type Fonts, Open Type Fonts, Methods of type arrangement, classification of typeface of font designing.

UNIT-III

INTRODUCTION TO TYPE DESIGN : Design style, Grouping of Type Faces, Type Families, Introduction to Indian Type Faces, Function of type Composition, Readability, Legibility, concept of Spacing- Letter Spacing, Word Spacing, Line Spacing, Paragraph Spacing.

PRINT PLANNING OF PACKAGE: Introduction to Layout, Terms in Layout Planning, Stage of Layout Planning, Rough layout, comprehensive and artwork. **ORIGINALS:** Introduction to originals, Type of originals, sizing, masking and cropping.

UNIT-IV

COMPUTERS IN DESIGN: Introduction to Computer in Design, Introduction to Desktop Publishing, Introduction to Desktop Designing. Introduction to Designing Software. Uses, Applications, Advantages and Limitations of Prominent Design Software.

DESIGNING FOR PRINT PRODUCTION: Introduction of Printing Processes for Design Prospective. Selection of an appropriate printing process for printing of a job.

What is 3D? Visualizing three dimensional effects, from 2D drawings. Perspective: sense of perspective drawing. Understanding of scale and sense of proportion.

Text & Reference Books:

1. **The Designer's Handbook** by Alistair Campbell
2. **Design & Technology** by Van No strand
3. **Handbook of Advertising Art Production** by Schelmmer.
4. **Art & Production** by N.N. Sarkar.
5. **Advertising, Art & Production** by J. Nath.
6. **A.C. Book (C.D.) so hick, Fundamental of copy and layout**,Crair Book.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	--	3	--	--	--	1	1	1	1	2	2	--
CO2	1	1	1	--	2	--	--	--	1	1	2	2	2	1	--
CO3	2	2	2	--	3	--	--	--	2	2	2	3	2	3	--
CO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO6	2	2	3	1	3	--	--	--	3	3	2	2	2	3	--

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GRAPHIC DESIGN IN PRINTING LAB

General Course Information	
Course Code: PCC-PTG203-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Outline various graphics designing fundaments	L1
CO 2	Describe graphics designing attributes in printing	L2
CO 3	Use various softwares for developing design	L3
CO 4		H1
CO 5		H2
CO 6	Create various designs for printing and packaging	H3

List of Experiments

1. Study of Colour, Colour theory, Colour wheel and various Colour Schemes.
2. Study of Designing softwares for various package Design.
3. Study and Practice of knowledge of different computer commands used in Designing softwares.
4. Study of printing considerations for typical designs.
5. Understanding concept of Sizing, Mashing & Cropping of photographs/originals.
6. Enlisting the elements and designing of Visiting Card, Letterhead, Envelop, Bill form, Receipt, Invitation card.
7. Enlisting the elements and designing of Title page of a Book, Magazine Cover page
8. Study of elements and designing of Logo
9. Preparing Artwork for various Packaging applications i. e Cosmetics, Cartons, Corrugations, Pharmaceuticals etc.
10. Study of Flexible and Rigid Package Designs and Printing Considerations.
11. Understanding the impact of colour in packaging

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	--	3	--	--	--	1	1	1	1	2	2	--
CO2	1	1	1	--	2	--	--	--	1	1	2	2	2	1	--
CO3	2	2	2	--	3	--	--	--	2	2	2	3	2	3	--
CO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO6	2	2	3	1	3	--	--	--	3	3	2	2	2	3	--

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CONTENT MANAGEMENT IN PRINTING

General Course Information	
Course Code: PCC-PTG207-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Describe utilities of content management in printing	L1
CO 2	Classify different content management systems	L2
CO 3	Apply the principles of ware housing and digital asset management systems for managing content	L3
CO 4	Distinguish different content management systems and data warehouse architecture systems	H1
CO 5	Select right CMS for right applications in printing organization	H2

UNIT-I

Content management: Definition, Purpose, Use of Content management in Printing and Packaging industry. Scope of Content Management System

Document Life Cycle: its stages and Supporting Technologies, **Stages of any content management system:** Content Management Life Cycle (Creation, Editing, Publishing/Delivery, Update/version control, Removal), Roles and responsibilities of Creator, Editor, Publisher, Administrator, Consumer, **Various file formats of Content**

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UNIT-II

Content Management System: Definition, purpose, Salient features, Components- Software & Hardware, Types of CMS, Types as per source- Open, Proprietary , Types as per delivery – Single Source Publishing(SSP) - Separate outputs, Rights-based login, Dynamic filtering Multi source Publishing(MSP), Types as per content – Mobile CMS, Web CMS, Enterprise CMS, Component CMS

UNIT-III

Digital Asset management system, Document Management System, e-Publishing. **Version control** and its importance, **Different design of Version Control**: Local version control System, Central version control System, Distributed version control System, Version controlling process. **Multichannel delivery**

UNIT-IV

Data Warehouse – Definition, History, **Data warehouse Architecture**: Essential properties required, Single Layer Architecture, Two Layer Architecture, Three Layer Architecture, Architecture of Data warehouse, Data warehousing concepts : ROLAP, MOLAP. Schema and its type in Data Warehouse, Design Methods, Metadata – Definition, Purpose, Type, Structures, Use, Metadata Publishing

Text & Reference Books:

1. Data Warehousing By Amitesh K. Sinha
2. Data Warehouse Design : Modern Principles and Methodologies By Golfarelli & Rizzi

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	--	--	--	--	--	1	--	2	1	--
CO2	1	1	1	--	--	--	--	--	--	--	--	1	1	1	--
CO3	2	2	2	--	2	--	--	--	1	1	1	2	2	1	--
CO4	1	1	1	1	--	--	--	--	--	1	--	--	2	1	--
CO5	2	2	2	3	3	--	--	--	--	--	1	2	2	1	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Syllabus for Printing Technology

2nd Year (4th Sem.)

APPLIED SCIENCE FOR PACKAGING MATERIALS

General Course Information	
Course Code: BSC-PTG202-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Describe numerous packaging materials and its specialties	L1
CO 2	Learn comprehensive knowledge of various packaging materials	L2
CO 3	Interpret technical knowhow required for different packages.	L3
CO 5	Select appropriate materials and its importance for packaging applications	H2

UNIT - I

Corrugated Board: History, Introduction to Corrugated Board, Board Construction - Liners, Flutes, Laminations or Liners and Fluting Medium, Flute Design and Selection, Manufacturer Joint. Corrugation, Stacking Strength. Requirements for corrugated fibre board boxes for single wall, double wall and triple wall. **Solid Fibre Board and Composite Container:** Introduction to Solid Fibre Board, Introduction to Combination Board, Introduction to Composite Container and its types, Advantages to Composite Container, Introduction to Multiwall paper sacks. Advantages and uses of Multiwall paper sacks.

UNIT – II

Glass in Packaging : History, Introduction to Glass Materials, Composition of Glass, Chemical Structure of Glass, Raw Materials used for manufacturing glass containers, Properties of Glass, Types of Glass, Types of glass containers, Uses, Applications Advantages & Disadvantages, Types and Design of Bottles, Closures, Seals. Glass Industry, Market Overview.

Wood Based Packaging: History, Introduction of Wood Materials, Physical Characteristics of wooden Containers, Types of Boxes - Nailed Boxes, Wire bound Boxes, Cleated Box, Wooden Crates, physical and mechanical properties of timber, Defects of timber, methods of preservation of timber.

UNIT - III

Metals in Packaging: History, Introduction of Metals - Overview of Extraction Processes, Important Metals in Packaging & their properties (Physical, Chemical & Mechanical), Aluminium based, Conversion processes for Sheets, Aluminium Foil, properties & their applications. Market & Industry Overview

Steel based: Stainless & Galvanized Steel - Coated steels like Tinplate, Tin free Steel, **Metal Cans:** History of Metal Cans, Types of Metal Cans - Three piece & Two piece Cans, Welded & Seamless Cans, Can Dimensioning. **Introduction to Metal Collapsible Tubes** - its design, Advantages & Disadvantages. Introduction to Aerosol Containers Classification of Aerosols, Advantages & Disadvantages of Aerosols.

UNIT - IV

Cushioning Materials: Cushioning materials, Factor Considered in cushion design, Need of cushion Packaging, Properties of cushion materials, Solid vs Loose fill, Foam-in-place, Cushion curves and design, corrugated as a cushioning material, Economics of cushion designing and advantages - packaging costs vs product damage.

Biodegradable and Recyclable Packaging Material : Concept of Recyclable Materials for Packaging, Concept of Biodegradable Materials in Packaging, Types of Biodegradable and Recyclable Packaging Materials – Paper, Card, Board, Corn Starch, Biodegradable plastic and its types.

Text & Reference Books:

1. **Hand Book of Paper and Board**, Herbert Holik, Wiley-VCH, 2006
2. **Paper and Paperboard Packaging Technology**, Mark J. Kirwan, Blackwell Publishing, 2005
3. **Encyclopaedia of Packaging Technology -** by K. L. Yam, The Wiley, 3rd ed., Wiley, 2009
4. **Fundamentals of Packaging Technology -** by W. Soroka, 4th ed., IoPP, 2009
5. **Handbook of Package Engineering -** by J. F. Hanlon, 3rd ed., CRC Press, 1998
6. **The Packaging User's Handbook** - by F. A. Paine, Springer, 1990

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	--	--	--	--	2	1	--	--	--	--	--	3	1	1
CO2	2	--	--	--	--	2	2	--	--	--	--	--	3	1	1
CO3	3	1	--	--	--	2	1	--	--	--	--	1	2	1	--
CO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	2	1	2	--	--	2	1	1	--	--	--	--	2	1	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TECHNOLOGY OF FLEXOGRAPHY

General Course Information	
Course Code: PCC-PTG202-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To define various tools and techniques used in flexographic print production	L1
CO 2	To describe the flexographic printing process, flexo presses and their markets in the current scenario	L2
CO 3	To apply Quality Control in flexographic printing workflow	L3
CO 4	To examine most inclusive areas where flexography printing used in printing industry	H1
CO 5	To identify printing challenges in flexographic printing	H2
CO 6	To develop knowledge about recent trends, future implications and applications of flexo presses to both consumers and printing & packaging industry	H3

UNIT I

INTRODUCTION TO FLEXOGRAPHY: Introduction to Flexography Overview of major conventional printing technologies, the flexographic potential, History of process. Working principle, features, characteristics and advantages of flexography, its limitations & applications. Comparison with other major printing process, basic elements of flexography. Design considerations.

IMAGE CARRIER PREPARATION: Objectives of general flexographic printing image carrier. Moulded rubber plates; Photopolymer plates – Sheet photopolymer, liquid photopolymer, Direct Imaged Plates, Laser Design Rolls and Flexo CTP. Properties, Benefits, Comparisons, Handling and Storage of Flexographic Plates. Plate considerations – plate handling, storage, wrap distortion, Ink & solvent compatibility, quality.

UNIT II

MOUNTING AND PROOFING: Need and significance of plate mounting operation, Introduction to mounting. Types of mounting procedures: Double-sided Tape, Magnetic, Sleeve, pin register system, Plate

mounting and proofing machines. Plate mounting procedures, plate staggering, plate make ready; Manual Mounting, Video mounting, Sleeve mounting, Pin mounting, Proofing procedure.

THE FLEXOGRAPHIC PRINTING PRESS: Press types -Working, advantages & Limitations of Stack, Common Impression, Inline, narrow web, wide web. Characteristics of the flexo press; components of flexo press; Variations of press – coating, lamination, corrugated post-printing; The Printing System- Inking Configurations, Anilox Roll, Ink feed, Doctor blade, Ink fountain; Types of flexographic presses and their Markets, Examples of flexographic printing presses; Anilox roll - construction, cell structure, anilox roll wear, selecting the night anilox roll, chrome plating. Fountain rolls - formulating rubber for rolls, Flexo roller covering, Care of covered rolls.

UNIT III

ACCESSORIES AND AUXILIARY EQUIPMENT: Computer control Consoles; Infeed and Delivery equipment; Tension control of webs; Register control; Dryers; Web Scanning; Ink control; Robots; Other Auxiliary equipment- sheet cleaner, spray powder Applicator, Static eliminator, electronic Impression control.

FINISHING EQUIPMENT: Characteristics of finishing equipment; Coaters; Sheeters and Slitters; Die-cutters; Laminating; Foil Stamping and Embossing; De-metallizing.

SUBSTRATES AND INKS: Absorbent and Non-absorbent substrates, physical properties, printing characteristics, Special substrate. Substrate's surface and optical properties affecting printing resolution.

INKS: End-use requirements, introduction to printing inks, ink vehicles, ink classifications, principles of ink selection, ink consumption, ink quality assurance tests and ink storage. Ink's surface and optical properties affecting printing resolution, Basic requirements for process color printing, flexographic printing characterization, ink density and standardization, dot gain.

UNIT IV

BAR CODES: Bar Codes and the package printer; Structure of Bar Codes and their symbols; Specifications for printing Barcodes, Printing the Bar code symbol; Verification of barcodes; generating the barcode symbols

QUALITY CONTROL AND ENVIRONMENT & SAFETY: Introduction, Characteristics of quality, economics of quality improvement, the principles of total quality management, statistical process control, tools of statistical process control, element of process control in flexography. ISO 9000. Environment & Safety Clean Air Act, Toxic substance control act, Resource conservation & recovery act, occupational safety & health act.

TEXT BOOKS:

1. "Flexography : Principles & Practices", 5th Edition, FTA, 2000.
2. "FIRST: Flexographic Image Reproduction Specifications & Tolerances", 3rd Edition, FTA, 2003.

REFERENCE BOOKS:

1. Frederick R.Boyle, "The Flexo Environment", Foundation of Flexographic Technical Association, 2002.
2. Anthony White, "High Quality Flexography", Pira reviews of Printing, Pira International, 1992.
3. Donna C.Mulvihill, "Flexography Primer", GATF Press, 1991.

4. Helmut Kiphhan, "Handbook of Print Media", Springer Verlag, 2001
5. J.Michael Adams David, Fauz, Llyod, J.Rieber, "Printing Technology", 5th Edition, Delmar Publishers, 1988
6. Herbert L. Weiss,Flexography Proficiency, Converting Technology Corp.
7. Michael Barnard "The Print & Production Manual" PIRA

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code :PCC-PTG202-P						Course Title: Technology of Flexography								
Program Outcome (PO)												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3
CO6	3	2	2	2	3	3	3	3	3	3	2	3	3	3	2

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TECHNOLOGY OF FLEXOGRAPHY LAB

General Course Information	
Course Code: PCC-PTG202-P Course Credit: 1.5	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To define various practical tools and techniques used in flexographic print production	L1
CO 2	To describe the practical utilization of flexographic printing process, plate preparation methods and flexo presses	L2
CO 3	To operate various procedures adopting for flexographic printing	L3
CO 4	To examine the trouble shoot on flexography machine	H1
CO 5	To identify and evaluate the various tests on flexographic prints.	H2
CO 6	To develop ability, skill & knowledge to operate the flexo presses	H3

List of Experiments:

1. Introduction and familiarizing the flexographic press and its components.
2. Introduction to construction and features of flexographic unit.
3. Preparation of Rubber Plates.
4. Preparation of Photopolymer Flexo Plates- Liquid and Sheet.
5. Flexographic Plate Mounting with varying plate dimensions, adhesive strength and repeat length.
6. Pre-Makeready, Make-ready & Post Make-ready Procedures and Setting up of single and multicolour flexographic press for printing.
7. Study of various flexographic substrates i.LDPE, ii.HPDE, iii.Paper, iv.Aluminium foil.
8. To print single color & two color job on given absorbent & non-absorbent stock and analyze print quality.
9. To study tension setting on flexographic machine.
10. To analyze effect of anilox & fountain roller pressure on print.
11. Study of Hybrid Printing Systems combining flexography printing technology.
12. Studying modern flexographic machines and enumerate finishing & auxiliary operations- inline, offline and online.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code :PCC-PTG202-P						Course Title: Technology of Flexography Lab								
Program Outcome (PO)												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	3	1	1	1	3	2	3	3	3	3	2
CO2	2	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	1	2	3	3	2	2	3	3	2	3	3	2	2
CO4	3	3	2	3	3	2	3	2	3	2	3	3	3	2	2
CO5	2	3	3	3	3	2	1	1	2	2	2	3	3	3	1
CO6	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3

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METHODOLOGY OF COMPOSITION IN PRINTING

General Course Information	
Course Code: PCC- PTG204-T **Course Credit:** 3 **Contact Hours:** 3/week, (L-T-P:3-0-0) **Mode:** Lectures and Tutorials **Examination Duration:** 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To define various tools and techniques used in print composition	L1
CO 2	To describe the utilization of composition software and DTP in printing	L2
CO 3	To apply principles of composition in the field of printing industry	L3
CO 4	To examine most inclusive areas where DTP, imagesetters and computer can be used in printing industry	H1
CO 5	To select and evaluate usages of MS excel and fonts used in composition	H2

UNIT – I

Composition Software - Automatic Page Make up, Margin terminology, Text and Graphics Integration. Acquiring Text- Automatic &human input, Keyboards, OCR working, procedure,factors affecting performance, AVR - Limitations&advantages, Pointing device, mouse, light pen, touch screen. Text transferring data - capture device, tale communications, modems, ISDN. General rules of page make up. Page orientations,Preparing copy for press, text and graphics combination.

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UNIT – II

Basic principle of Image setter, film transport method, Price, Laser type & Processing, Environmental issues etc. Small, Medium and Large Sized Image setters. Page description languages. Post Script Language - Introduction, Importance of PostScript Fundamentals, Adobe Acrobat, MS – Word & its commands. Hot &Cold Type Composition, Photo letter drawing, Photo typesetting -Introduction, Advantages.

UNIT – III

Components, Applications & Benefits of DTP. Developments. Content backup, Output quality, and speed, Page make up. Software used in DTP. Heavy, medium & light duty Programmes, Graphic programs. Type manipulation software, Page make up software – document & text handling, applications. DTP solutions, DTP designing for – Newspaper, Magazine, Books, Advertisements. DTP – Integral part of big Printing organizations.

UNIT – IV

MS Excel - Table preparation, MS Power Point Presentation basics. Image insertion & modification. Page display. Graphics tablets, Scanners, digitizers.

Digital Fonts, Types of Fonts, True type fonts, Post Script Type1, Open type fonts, Adobe Type Manager, Transferring fonts, Vector & Bitmap formulation, Raster Image Processing, Future trends and developments.

Text & Reference Books:

1. Desk Top Publishing 4th edition – **Kirtywilson, Davis, Ron Strutt**.
2. Typesetting-Composition-**Geoff, Barlow**
3. Word Processor to Printed Page - **Micheal Card**
4. Digital Typography-**Donald E.Knuth**
5. Introduction to Prepress - **Hugh MSpeirs**
6. Introduction to Printing Technology - **Hugh MSpeirs**
7. Composing and Typography Today - **Mendiratta.B.D.**
8. Hand Book of Typography - **Kailas Takle**.
9. Guide to DTP -**James Cavuoto**
10. Printing Technology – **Adams, Faux, Rieber (5th Edition)**
11. Printing in a Digital World – **David Bergsland**

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Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC- PTG204-T **Course Title:** Methodology of Composition in Printing

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Outcome (CO)	CO 1	2	2	1	2	3	1		2	3	2	1	3	3	3	2
	CO 2	3	2	1	2	3	2		2	3	3	2	3	3	3	2
	CO 3	2	2	3	2	3	2	1	1	3	2	3	3	3	3	3
	CO 4	3	3	2	2	3	2	1	1	2	2	2	3	3	2	2
	CO 5	3	3	2	3	3	2	2	2	3	2	3	3	3	3	2

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METHODOLOGY OF COMPOSITION IN PRINTING LAB.

General Course Information	
Course Code: PCC- PTG204-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To define various practicaltools and techniques used in print composition	L1
CO 2	To describe the practical utilization of composition software and DTP in printing	L2
CO 3	To deploy and demonstrate composition methods in the field of printing industry	L3
CO 4	To examine most inclusive practical areas where DTP, imagesetters and computer can be used in printing industry	H1
CO 5	To appraise visiting cards, pamphlets, folders and other originals prepared with the help of computer technology	H2

List of Experiments-

1. Key board & its various aspects.
2. M.S.Word – Justification works, column work, editing work.
3. Fonts & type style changing, word art, different commands.
4. Preparation of Visiting cards, Letterhead.
5. Page makeup of pamphlets/ Inserts.
6. Basics of advertisements, folders, journals, book work.
7. Picture and text manipulation & their combinations.

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8. Resizing the images (enlarge and condense).

9. Table work setting & data entry.

10. Basics of Dot matrix, Inkjet printer, Laser printer.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Code: PCC- PTG204-P **Course Title:** Methodology of Composition in Printing

(1/2/3 indicates strength of the correlation) 1-Weak, 2-Medium, 3-Strong

		Program Outcome (PO)												PSO		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Outcome (CO)	CO 1	2	1	1	1	3	1	1	1	3	2	3	3	3	3	2
	CO 2	2	2	1	2	3	2	1	2	3	3	2	3	3	3	2
	CO 3	2	3	3	2	3	2	1	1	3	2	3	3	3	3	1
	CO 4	3	3	3	2	3	2	1	1	3	2	2	3	1	3	3
	CO 5	2	3	2	3	3	2	2	2	3	2	3	3	3	3	3

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TECHNIQUES OF PRINTING IMAGE GENERATION

General Course Information	
Course Code: PCC –PTG-206-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	Students will be able to define various tools and equipments used in Plate making department.	L1
CO 2	Students will be able to explain various plate making techniques for different printing processes.	L2
CO 3	Students will be able to apply the concepts related to various machines and tools in plate making department.	L3
CO 4	Students will be able to compare the different concepts and principles for plate making techniques.	H1
CO 5	Students will be able to select appropriate technique to make suitable image carrier for a particular printing process.	H2

UNIT-I

ASSEMBLY DEPARTMENT:

Assembly of Film Images: Equipment's and Tools required, Materials and Supplies: Photographic film (Camera Film, Contact Film, Duplicating films); **Proofing materials:** Diazo papers, Polymer papers, Brown Print paper, Diffusion Transfer material, Photographic Paper. **Assembly and masking materials**: Goldenrod, Vinyl, Clear Film, Peel able Masking Films, Photographic masking films. **Stripping supplies**: Screen Tints, Pressure Sensitive Tapes, Adhesives, Opaque's, Cleaning Solutions, Register Tabs Button & Pins. Register masks, GATF image contact masks. **Kinds of press layout**: One-up layout, one side multiple layout, Sheet wise layout, Work-and-Turn layout, Work-and-Tumble layout

UNIT-II

IMAGE CARRIERS FOR PLANOGRAPHY: Light Sensitive Coating: Di-cremated colloids, Diazo Compounds, Photo Polymers; Sensitivity of coating to light, Dye-sensitized photo polymerization,

dark reaction, post exposure, safe lights, reciprocity law; Action of light sources on coatings, stabilities of coatings; **Plate materials**: Zinc, Aluminum, Brass, Copper, Steel, Chromium; Action of oil and water on metal - Contact Angle; **Introduction to Graining of plates-** Mechanical Graining, Electrochemical graining; **Light sources for plate making**: Metal Halide, Mercury Lamps, Pulsed - xenon, Laser; **Types of Plates**: *Pre-sensitized plates*- Negative Working Plates, Positive working plates; *Multi-metal plates* - Producing a multifocal plate, Types- Bi-metallic, Tri-metallic; Introduction to Deep Etch plates, Wipe on Plates; **Toray Waterless Plates**- Structure, Processing and use, Advantages and Disadvantages; Application of Gum on plate.

UNIT-III

IMAGE CARRIERS FOR FLEXOGRAPHY AND GRAVURE:

***Flexography*: Introduction to Flexographic plates; Photo initiators, Photo Sensitizers and Washout Solvents. **Photopolymer Flexographic Plates:** Sheet Photo Polymer Plates, Liquid photo polymer plates; Base material for photo polymer plates, Advantages of photo polymer plates; Disadvantages of photo polymer plates; Rubber Flexographic plates, Photo Engravings, Duplicate Plates. Advantages of Rubber Plates, Disadvantage of Rubber Plates.

***Gravure*: Methods of Cylinder Preparation**: Diffusion Etch Method, Direct Transfer Method, Electromechanical process, Laser Cutting Method. **Well formation**: Lateral hard dot wells, Direct Contact Wells, Conventional Gravure Wells. **Cylinder Design:** Parts of Gravure Cylinder, Forms of Gravure Cylinder- Integral Shaft, Mandrel. Copper Plating and Polishing. Reuse of Cylinders. Ballard Shell Cylinders.
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UNIT-IV

SCREEN PRINTING AND DIGITAL IMAGE CARRIERS:

***Screen Printing*: Stencil Making:** Hand Painted Stencil - Introduction, Block-out methods (selective process) - wax resists method. Knife cut stencils. **Stencil Cutting Tools and Cutting Techniques** - Swirl knife, Computerized stencil Cutting. *Photomechanical stencil making* - Indirect photo stencil film - making an indirect Photo stencil, indirect photo polymer film. Automatic processing and development, direct emulsion photo stencil - making a direct emulsion photo stencil

***Digital Image Carriers*:**
Image generation of a Digital Offset Machine; Laser plate making system; Computer-to-Plate - Thermal plate, Polyester plate. Auto Plate Processor. Troubleshooting for plates

Text & Reference Books:

3. Heidelberg DI Press- Manual Chemistry for Graphic Arts - **Dr. Nelson R. Eldred**.
4. Offset Plate Making - **Robert F. Reed**. Printing Technology 3rd Edition. - **Adams, Fax &Rieber**.
5. Screen Process Printing - **John Stephens**. Sheet fed Offset Press Operating - **Lloyd P. Dejidas**.
6. Flexography Premier - **Donna C. Mulvihill**. Stripping - **Harold L. Peck**.
7. Gravure Process and Technology –GAA. Selecting The Right Litho Plate - BPIF.
8. A. L. Gatehouse; Manual for film planning and plate making; roper – GATF Publication, 1983 edition.
9. Lithographers Manual – GATF seventh edition.
10. Paul J. Hartsuch Chemistry for the Graphic Arts, GATF, 1983 edition.
11. Lan Faux, Modern lithography, MacDonald & Evans Publication, 1973. Edition.
12. Lithographic Image Carriers by C.S. Mishra
13. Printing Technology by Adams, Faux, & Rieber

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**1**	**1**	**3**	**3**	**-**	**1**	**3**	**2**	**2**	**3**	**3**	**3**	**1**
CO2	**3**	**2**	**3**	**2**	**3**	**2**	**-**	**1**	**3**	**2**	**1**	**3**	**3**	**3**	**1**
CO3	**3**	**3**	**2**	**1**	**3**	**2**	**1**	**1**	**3**	**2**	**2**	**3**	**3**	**3**	**1**
CO4	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**3**	**1**	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**3**	**1**	**2**	**3**	**3**	**3**	**3**

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TECHNIQUES OF PRINTING IMAGE GENERATION LAB

General Course Information	
Course Code: PCC-PTG206-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe all tools and equipment used in plate making department.	L1
CO 2	To identify practically the concept and principles of Image generation.	L2
CO 3	To demonstrate the functioning of machines and tools used in image generation department.	L3
CO 4	To perform experiments with machines and other materials to prepare the final image on image carrier.	H1
CO 5	To select and evaluate the prepared image on image carrier of different printing processes.	H2

List of Experiments

1. Comparative study of various materials and equipment used in Printing Image Generation Department.
2. Assembling positives for four colour jobs
3. Layout preparation
4. Study of Wipe-on plates.
5. Study of Albumin plates and Deep-etch plates.
6. Preparation of Pre-sensitized plate
7. Study of gripper margin and registration processes
8. Study of Flexographic plates and Gravure Cylinder
9. Study of Digital Plates

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10. Surface Preparation for Screen Printing Process

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**1**	**1**	**1**	**3**	**1**		**1**	**3**	**2**	**1**	**3**	**3**	**3**	**1**
CO2	**3**	**2**	**1**	**2**	**3**	**2**		**2**	**3**	**3**	**2**	**3**	**3**	**3**	**1**
CO3	**3**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**3**	**2**	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**

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SHEET FED OFFSET TECHNOLOGY

General Course Information	
Course Code:PCC- PTG301-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0)	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To study and explain the various categories of offset press and the principles behind it.	L1
CO 2	To describe the various units of a sheet fed offset press.	L2
CO 3	To demonstrate five units of the offset press	L3
CO 4	To explain and indicate various print trouble shooting.	H1
CO 5	To analyse the various print quality factors and their implications	H2

Unit: 1

History of lithography, print media and classification of printing organizations. Recent trends in offset press technology. Basic principles of sheet fed offset printing. Construction and categories of sheet fed offset press. Safe handling of tools, equipment and materials in offset press department. Various units of a sheet fed offset press and their basic functions.

Unit: 2

Feeding unit: Functions of the feeding section, sheet feeding types, feeding cycle, components of feeder, sheet conveying mechanisms, sheet detectors, sheet register, front lay and side lay, sheet insertion systems, grippers. Inking unit: role and function of inking

system, different parts of inking system, split duct techniques, types of rollers in the inking system, setting of the rollers, care and maintenance of rollers, different inking systems.

Unit: 3

Dampening system: role and function of the dampening system, fountain solution, pH and conductivity of the fountain solutions, role of water in fountain solution, role of alcohol or alcohol substitutes in fountain solution, different rollers in the dampening system, roller coverings, doctor dwell, desensitizing the metal rollers, different dampening systems, care and maintenance of the dampening system. Printing unit; different cylinders and their construction, cylinder gears, cylinder gap, bearers, undercut, cylinder packing, patching, printing pressures. Pre-make ready and make ready. Progressive print out.

Unit: 4

Delivery section: role and function of delivery section, transfer cylinder, sheet transfer, sheet delivery, short and extended delivery systems, sheet control devices, anti-set off spray powder unit. Machine productions. Troubleshooting. Printing machine maintenance. Quality control in sheet fed offset press and introduction to ISO 12647-2 standards.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code:PCC-PTG301-T					**Course Title: SHEET FED OFFSET TECHNOLOGY**										
	Program Outcome (PO)										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

Text & Reference Books:

1. "Sheet Fed Offset Technology" by **Prof. Anjan Kumar Baral.**
2. "Printing Process" by **Prof. Anjan Kumar Baral**.
3. "Hand Book of Print Media" by **H. Kippan.**

SHEET FED OFFSETTECHNOLOGY LAB.

General Course Information	
Course Code: PCC- PTG301-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Outline the various operations of sheet fed offset press	L1
CO 2	Describe and understand the different units of sheet fed offset press	L2
CO 3	To set the different units of a sheet fed offset press	L3
CO 4	To set the machine for two colour printing	H1
CO 5	To set the machine for four colour printing	H2

List of Experiments:

1. Study of various offset printing machine controls and operations.
2. Analysis of different units of a sheet fed offset press.
3. Study of the lubrication system.
4. Setting the feeder, feed board, lays and delivery.
5. Setting the dampening and ink rollers and fixing the plate.
6. Machine setting for Single colour printing.
7. Machine setting for Two colour printing.
8. Machine setting for Four colour printing.

Course Articulation Matrix:

Course Code:PTG301-P						**Course Title: Technology of Sheet Fed Offset Lab.**								
	Program Outcome (PO)												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY

General Course Information	
Course Code: PCC-PTG303-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe basic principles of reproduction photography	L1
CO 2	To learn comprehensive knowledge of halftone to continuous tone originals	L2
CO 3	To interpret technical knowhow required for auxiliary exposures	L3
CO 4	To know basic principles of line separations	H1
CO 5	To select appropriate materials and its importance for reproduction photography	H2

UNIT – I

Basic principles of reproduction photography: line photography; Basic density range of line original Basic line exposure for computerized camera with on-line or off-line densitometer, equipment's and accessories. **Difficult line originals** - Line originals with colour; line originals with fine lines screen; line originals with fluorescence effect. **Contact photography** - Spreads and chokes. **Line separation from black and white art work.**

UNIT – II

Halftone photography: Introduction to the concepts, Theories of dot formation, Selection of screen ruling, Introduction to different halftone screens glass screen (brief study), contact screens - Grey and magenta Contact screen manufacture, Density gradient of contact screens, Negative, positive, standard or universal contact screen. Comparative study of glass and contact screens.Pre-screened emulsion.

Half tone exposure: Special features of half tone exposure. Factors affecting the halftone exposure Basic halftone exposure setting on ordinary and computerized camera with off-line and on-line densitometer.

Contrast control : Contrast with glass screen : S.D. variation, multiple stop system (brief study) Contrast control with contact screens Determining B.D.R. and main exposure of the contact screen, Highlight compensation, Use of CC filters with magenta contact screen determining CC filters and exposure calculations.

Auxiliary or supplementary exposures: Contrast control with supplementary exposures. **Flash exposure**: Deciding the basic flash exposure, for contact screens Exposure calculations. **No-screen exposure-calculations.**

UNIT - III

Line and halftone combination, Evaluation of halftone negative **Colour reproduction**: Definition and concepts Introduction to Corpuscular and Wave nature of light the visible spectrum Additive synthesis and subtractive synthesis Additive and subtractive combination for graphic for reproduction and practical interpretation of colour-theories. Mechanism of vision and theories of colour-vision. **Colorimetric Properties**, Colour and appearance measurement. Introduction to Colorimeter and Spectrometer.

UNIT - IV

Introduction to colour separation methods and evaluation of direct colour separation. Colour separation and analysis:

a) FAKE colour reproduction
b) Filters- Colour separation filters and other filters; Overlap in the filters. Wide band and Narrow cut Filters factors and filter ratios.
c) Screen angles-Moire, juxtaposing rosettes. Basic rules in angular adjustment. Reproduction of Pre-Printed color originals.
d) Study of quality control aids, gray scale, set of colour control patches; Register marks; Register -punch, pin-bars etc.

Digital photography: Electronics and digital imaging.Introduction. The current state of the market. Digital camera, Image quality, digital camera bags, multiband digital cameras. Choosing the right camera for the application. Resolutions- Introduction, monitor spatial resolution, photographic film formats, resolution and their digital equivalents. CCD

technologies-Introduction, technology,commercialmanufacture of ccd's,construction of ccd,ccd application, ccd cameras for the professional photographic market, colourresolution. Implementation-Lighting for digital photography, over & under exposure characteristics, color balance &consistency, image manipulation.Optics& digital photography – Basic principles of lens selection.

Text & Reference Books:

1. Line photography - **Karl Davis Robinson.**
2. Halftone Photography -**Erwin Jaffe.**
3. Small Offset Preparation & Process-**Les Crawhurst**
4. Printing Technology - **Adams, Faux, Rieber.**
5. Reproduction Systems -**V. S. Raman.**
6. Digital Photography-**Anthony Hamber, Phill Green.**

Course Articulation Matrix:

Course Code:PCC-PTG303-T COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY															
	Program Outcome (PO)												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO5	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3

COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY LAB

General Course Information	
Course Code: PCC-PTG303-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe basic principles of reproduction photography	L1
CO 2	To learn comprehensive knowledge of preparing halftone negatives and positives	L2
CO 3	To interpret technical knowhow required for using contact screens	L3
CO 4	To understand contrast control for halftone photography	H1
CO 5	To have comprehensive knowledge of fake colour reproduction	H3

List of Experiments

1. Setting of Camera.
2. Line negative and positive preparations.
3. Half tone negative and positive preparations
4. Bromide Positive preparations.
5. Contrast control with contact screens.
6. Contrast control with supplementary exposures.
7. Line and half tone combination.
8. Fake colour Separation (Positive) (Preparation of any four original).
9. Fake colour Separation (Negative) (Preparation of any two original)

Course Articulation Matrix:

Course Code:PTG303-P	**COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY LAB**														
	Program Outcome (PO)												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

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TECHNOLOGY OF GRAVURE

General Course Information	
Course Code: PCC-PTG305-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objective: To give the students comprehensive knowledge of Gravure Printing Process, applications, operations, quality control systems used in the industry.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe about Gravure Printing and its market in India & abroad.	L1
CO 2	To describe about Gravure Printing & Presswork	L2
CO 3	To describe about Gravure Printing substrates, inks and environmental consideration and safety	L3
CO 4	To describe about Gravure machine and components with their importance & handling.	H1
CO 5	To have deep understanding of various major components and their considerations for advance applications and printing of multicolour jobs.	H2
CO 6	To have deep understanding of various substrates and ink used for production process along with environmental considerations.	H3

Unit: I

History & Introduction: Evolution& History of Gravure, Gravure products & its market, Types of Gravure Printing: Publication Gravure, Packaging Gravure & Converting, & Product Gravure. Gravure industry in India and Abroad.

Gravure Presses & Presswork: Gravure printing process & basic Gravure Machine Designs. Rotogravure presses for Printing & Packaging application and their considerations.

Unit: II

Construction & Imaging of Cylinders : Gravure screens, Cylinder construction & Preparation - Thin layer method, Thick Layer method, Ballard Shell Treatment, Cylinder Design & its types, Gravure cylinder preparation, Sleeve & Solid cylinders, Considerations for Gravure Cylinder preparation. Chemical engraving methods & equipment's, Electronic engraving systems today. Image generation Methods for Gravure cylinders - Diffusion-etch method, direct transfer, Electro-mechanical process, Laser cutting, Cell configuration, advantages & disadvantages, Cylinder correction method. Well formation- Variables, Basic types, balancing the cylinder, copper plating & polishing, Reuse of cylinders. Sleeves & integral shafting of cylinder.Cylinder Imbalance - Static & Dynamic.

Doctor Blade : Introduction to Doctor Blade assembly, Doctor Blade Materials, Blade angles, Blade distance from nip, blade edge, blade mounting. Doctor blade holder configurations, preparing blade for use of doctor blade, Doctor blade problems. Doctor blade wear - Fatigue, corrosion, abrasive, adhesive wear.

Unit: III

Impression Roller &Driers:- Introduction to Impression roller, Function of Impression Roller, Roller covering, Roller pressure, Balance- static & dynamic., setting of impression roller on machines. Hardness of Impression roller for various application. Handling & Storage ofimpression roller.Impression mechanisms - mechanical, hydraulic, pneumatic.Impression roller problems.Gravure roller coating. New developments in this area.

Drying System in Gravure : Gravure Ink dryers - Need for ink dryer, Dryers Functioning, Heat sources for driers- Steam, Electric and Gas, Combination gas/Oil, Thermal oil, and Waste heat from incinerators.

Unit: IV

Gravure Substrates &Inks : Publication Paper substrates, Packaging Paper Substrates, Non paper substrates, Metalized Films & Foils. Inks & Additives for Gravure. Gravure Inks – Constituents of Gravure Ink, Dilution of Printing Ink, Types of Gravure Ink Water based, Solvent based. Polyurethane based, Vinyl based, Dye based. Different types of additives used for respective inks, other additives, Costing & Estimation of substrates, Inks & coatings.

Solvent Recovery System : Understanding of Solvent Recovery System and their benefits in Gravure Printing. Solvent recovery basics and their important aspects. Future of Gravure Printing & Packaging Industry, Future of Gravure Publication industry. Recent Trends and new developments in Gravure Industry.

REFERENCES

1. "**Gravure: Process and Technology"**, Gravure Education Foundation, 2003

2. **"A Guide to Graphic Print Production"**Kaj Johansson, Peter Lundberg, Robert Ruberg Wiley, 2002

3. **"Printing Technology"** Edition - 5E, by Adams.

4. **"A Hand Book of Print Media"** by Springer.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	1	1	2	2	2	1	3	3	3	2
CO2	3	2	1	2	1	2	1	2	2	2	2	3	3	3	2
CO3	3	2	2	1	3	1	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	3	3	2	3	3	2	3
CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	2	3

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TECHNOLOGY OF GRAVURE LAB

General Course Information	
Course Code: PCC-PTG305-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)**
	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To understand and handle about Gravure Printing press and its types.	L1
CO 2	To understand and explain Gravure Printing & Presswork with various components.	L2
CO 3	To describe about Various Pre & Post-press operations on Gravure Printing machines	L3
CO 4	To describe about Gravure machine and components with their importance & handling.	H1
CO 5	To have deep understanding of handling & operating of Gravure Printing machine with registration for multi color printing.	H2
CO 6	To have deep understanding of various running and printing faults in Gravure Printing.	H3

List of Experiments:

1. Study of Various Gravure Printing Machine Configurations.
2. Study of components of a Gravure Printing Machine.
3. Overview of Cylinder Preparation Methods.
4. Pre-make and Make Ready in Gravure printing process.
5. Study of Feeding Unit of Gravure printing Press.
6. Cylinder setting in Gravure Printing Machine.
7. Study of Doctor Blade assembly and setting on Machines.
8. Study of various drier and setting for various jobs.
9. Printing in Single colour job on different Substrates.
10. Printing in multi-colour on different Substrate.
11. Study of Gravure machine line for publication printing.
12. Study of Gravure machine line for package printing.
13. Study of printing faults, their causes and their remedies for Gravure Prints

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	3	2	2	3	2	2	3	2	3
CO6	3	3	3	3	3	3	3	2	2	3	2	2	3	2	3

INDUSTRIAL TRAINING PRESENTATION - I

General Course Information	
Course Code: PROJ-PTG301-P Course Credit: 1.0 Contact Hours: 3/week, (L-T-P:0-0-2) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** For the end semester examination, the presentation will be done by the students and Viva-Voce examinations will be conducted by External Examiner (preferably from Industry).

For industrial exposure of the students to the latest technology and to make them understand the workflow in the industry, training in the Industry forms a compulsory and significant aspect. Students will be trained in industry for a period of 3 weeks during the earlier semester vacations. Their performance will be periodically assessed by the staff in charge from the department and a coordinator industry. After completion of the training period the students will submit a detailed report. There will be a viva-voce at the end of the training and grades will be awarded along with the semester examination. The selection of the industry for the training should be printing/packaging and allied industry (technical support in relation with printing and packaing).

TECHNICAL PRESENTATION/SEMINAR

General Course Information	
Course Code: MC-PTG301-P Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:0-0-2) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** For the end semester examination, the presentation will be done by the students and Viva-Voce examinations will be conducted by External Examiner (preferably from Industry).

The course is introduced to enrich the communication, writing and presentation skills of the student on technical and other relevant topics. In this course, a student has to present technical topic/recent advances in printing, packaging and allied arena. The topic of the '**Technical Presentation/Seminar'** will be decided by the individual student in consultation with the concerned allotted guide and the report will be submitted by the student at the end of semester dully signed by allotted guide. The plagiarism report for the presentation/content should be enclosed in report dully signed by the student.

NEWSPAPER AND MULTIMEDIA

General Course Information	
Course Code: PEC-PTG151-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To list various newspaper organizations	L1
CO 2	To describe process of newspaper management	L2
CO 3	To demonstrate various principles of newspaper designs	L3
CO 4	To examine various applications of multimedia	H1
CO 5	To evaluate suitability of various input and output devices	H2

Unit -1

Introductionto Newspaper organization, Newspaper Hierarchy- editorial organization, mechanical aspects of newspaper organization – composition,Printing the Newspaper, flow chart of staff in newspaper organization, Newspaper Management and organization. Flow of stories in to newspaper office- varioussources and copy for each page. Reporters, Correspondents, Agencies, Syndicate, Columnists, Readers.

Unit -2

Design principles of newspaper, Design elements in Newspaper (advertisements, text matter, Headlines, and pictures), Introduction to Design and layout in Newspaper, Page Make-up in Newspaper (Front Page, Editorial Page, Section Page, Colour Page), Newspaper Format.

Unit-3

Introduction to Multimedia, Historical background of multimedia system, Multimedia components tools - text, audio, video, graphics, &animation, Hardware and software

requirements for multimedia, Role of multimedia, Applications and uses of multimedia,Developments of multimedia, future of multimedia,audio, video, animation, internet chatand Multimedia in society.

Unit -4

Hardware and multimedia:
Input devices- Keyboard and keypad, mice, trackballs, touchpads, sound input device, digital camera, graphics tablets, scanners, game controller,
Output and display devices- Monitors other display technologies, printers, speakers
Digital storage devices- Hard drives, removable storage discs
Processing components- CPU, Memory

Recommended Books:-

1. Art and Print Production by N.N Sarkar, Oxford University Press, New Delhi
2. News Reporting and writing- MelwinMecher
3. Editing ; A Handbook for journalist- TJS George
4. The journalist ; Handbook-M.V. Kamath
5. Editing ; A Handbook for journalist- TJS George, Indian Institute of Mass Communication, Delhi
6. Telling stories, Taking Risks- Klement/Mataline
7. Journalism in India –R. Parthasarathy
8. Headline and Deadlines- Baskette, Floyd
9. Multimedia Basics, Volume 1 by Andreas Holzinger, Firewall Media.
10. Fundamentals of Multimedia, Ze-Nian Li, Mark S. Drew, Pearson Prentice Hall, 2004
11. Principles of multimedia by Ranjan Parekh
12. Concepts of multimedia by MansafAlam
13. Introduction to multimedia by Ana Weston Solomon
14. Graphics and multimedia by 3GE-learning LLC, USA

Course Articulation Matrix:

Course Code:PEC-PTG151-T					NEWSPAPER AND MULTIMEDIA										
	Program Outcome (PO)												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

SUBSTRATES FOR PRINTING

General Course Information	
Course Code: PEC –PTG152-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	Students will be able to define various printing substrates used in printing industry.	L1
CO 2	Students will be able to explain applications of various substrates.	L2
CO 3	Students will be able to apply various tests to enhance the print quality.	L3
CO 4	Students will be able to compare the different types of substrate available.	H1
CO 5	Students will be able to select suitable substrate for a particular printing process.	H2

Unit 1

Paper: Introduction, Paper fibres & Pulps, Visual Appeal- Opacity, Smoothness, Paper Permanence, Strengths and durability, Absorbency, Dimensional stability. Fibre structure-cellulose, hemi celluloses and lignin. Recycled Paper- Introduction, Recycling process, Fibre Preparation. Applications. Printing Processes for paper printing.

Paper Types: Classification of Paper- Coated and Uncoated. Safety Paper, Bond Paper, Duplicator Paper, Carbonless paper, Offset paper, Cover Paper, Ledger Paper, Index Paper, Newsprint, Zink Paper, Recycled paper, Digital Paper, Specialist papers

Unit -2

Paper Board: Introduction, Difference between Paper and Paperboard, Types of Paperboard. Applications.

Properties for Paper and Paperboard: Physical Properties- Substance, Caliper, Bulk, smoothness. Optical properties- Gloss, Brightness, Opacity, Fluorescence

Unit -3

Paper Testing: Burst strength Test, Tensile Strength Test, Tear resistance, Folding endurance, stiffness test, moisture content test, Picking, Fluffing etc

Corrugated Board: Introduction, Types, Printing Process in Corrugated industry

Unit -4

Plastic film: Polycarbonates, Polyesters (PE), PVC, Polystyrene, Polypropylene (PP)

Miscellaneous: Wood, Leather, Canvas, Silk, glass, metalized films- Aluminium foil, foil laminations, advantage, limitations, future in printing.

References:

1. Printing Materials: Science and Technology - Bob Thomson, Pira international
2. Handbook of Package Engineering - Joseph. F. Hanlon, Robert J. Kelsey
3. Introduction to Printing and Finishing - Hugh M Speirs, Pira International
4. The Blueprint handbook of Print and Production – Michael Barnard, John Peacock and Charlotte Berrill

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	3	-	1	3	2	2	3	3	3	1
CO2	3	2	3	2	3	2	-	1	3	2	1	3	3	3	1
CO3	3	3	2	1	3	2	1	1	3	2	2	3	3	3	1
CO4	3	3	2	2	2	2	2	1	3	1	2	3	3	3	3
CO5	3	3	3	3	3	2	1	1	3	1	2	3	3	3	3

PRINTING ORGANIZATIONS AND LAYOUT

General Course Information	
Course Code: PEC-PTG153-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorial Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To define the print organization and management	L1
CO 2	To describe the procedure of site selection	L2
CO 3	To interpret the various tools and techniques of Plant Layout	L3
CO 4	To examine most inclusive areas where Factory Building and Analytical approach of plant layout used in printing technology	H1
CO 5	To identify the Plant layout challenges in printing industry	H2
CO 6	To develop knowledge about Printing Organization & Management Structure, selection of site, Plant Layout and its procedure, factory building and its analytical approach for printing technology	H3

Unit- 1

Printing Organization: Management- Nature scope and importance of Management, Functions of Management –Scientific, Management. Production and operations Management – Locations and Layout of plant, Maintenance management

Management Structure: Structure of organization, Formal and Informal organization, Market research, Sales promotion and Purpose of business management. Work flow and organizational structure in a printing press

Unit- II

Site Selection: Strategic issues of location. The supply-distribution system, Dynamic nature of plant locationlocation strategy-factors influencing choice of location. State regulations on location. Backward areas and Industrial policy. Govt. Polocies for decentralization, Industrial estates, comparision of locations-urban v/s rural areas advantages, sub-urban area. Economic survey of site selection. Analytical approach.

Unit- III

Plant Layout: Objectives of good plant layout, principles of plant layout, importance of plant layout, situations in which layout problem may arise, factors influencing plant layout, Methods of plant and factory layout-operation process chart, flow process chart, flow diagrams, string diagrams, machine data cards, templates three dimensional models, correlation chart, travel chart, load path matrix method. Types of plant layout -product layout or live layout - process layout or functional layout-combination layout - static layout or fixed position layout. Symptoms of bad layout. flow pattern-line flow, L type flow, circular flow, U type flow, S or inverted S combination of U and line flow pattern. Characteristics and place of application. Factors governing flow patterns: Combination of line flow and S type of pattern. Combination of line flow and circular type. Processing upwards. Retration type, Inclined flow. Workstation design-Storage Space requirements. Plant Layout Procedure.

Unit- IV

Factory Building (Press Building): Introduction, Advantages of a good factory building, Factors affecting the factory building - nature of manufacturing process-flexibility-expandability-service facilities-employee facilities-lighting-heating-ventilating-air conditioning-appearance- durable construction-security measures-noise control. Types of factory building - single story building, high bay and monitor type buildings, multi storey buildings, building of special types. Comparison between single storey and multistory building. Types of construction of factory building Wood frame construction, Brick construction, Slow burning mill construction, Steel frame construction,Reinforced concrete construction, Precast concrete construction. Specific parts of factory building-roof,walls,floor.

Plant layout-An analytical approach: Heuristic and other methods of line balancing. Planer single facility location problems. Minisum examples, insights for minisum problem, minisum location problem with distance. MLP with Euclidean distance.

Recommended Books :-

1. T.A. Saifuddin – Management aspects of printing industry by Nirmal Sadanadn Publishers, Mumbai, Ist edition.
2. G.G. Field- Printing Production Management by Graphic Arts Publishing, 1996.
3. R.D. Aggarwal-Organisation and Management-Tata McGraw Hill Publishing Ltd., New Delhi
4. Facility layout and location-**Richard L.Francis, John A. White**.
5. Computer Aided Production Management - **Mahapatra**
6. Production and Operations Management - **Mchelmann Oakland, Lockyer**
7. Practical Plant Layout - **Herold B.Maynard**
8. Industrial Engineering Management System- **Dr. S. Dalela, Dr. Mansoor Ali**
9. Industrial Engineering & Management - **O. P. Khanna**
10. Industrial Engineering and Production Management-**M. Mahajan**.
11. Materials handling for Printer - **A. John Geis, Paul L. Addy**.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code : PEC- PTG153-T						Course Title: PRINTING ORGANIZATIONS AND LAYOUT								
	Program Outcome (PO)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	3	1	1	1	3	2	3	3	3	3	2
CO2	2	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	1	2	3	3	2	2	3	3	2	3	3	2	2
CO4	3	3	2	3	3	2	3	2	3	2	3	3	3	2	2
CO5	2	3	3	3	3	2	1	1	2	2	2	3	3	3	1
CO6	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3

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INTRODUCTION TO PACKAGING

General Course Information	
Course Code: PEC –PTG154-L Course Credit: 3 Contact Hours: 3/week, (L-T-P:3- 0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	**Course Outcomes** **At the end of the semester, students will be able to :**	**RBT Level**
CO 1	Describe the concept of packaging	L1
CO 2	Recognize various hazards of packaging	L2
CO 3	Choosing different graphics/package design for particular applications	L3
CO 4	To gain knowledge regarding various cellulosic packaging materials	H2
CO 5	To understand principles of metal and wooden packaging	H3

Unit-I

Introduction: Packaging – History, Need & Evolution of Packaging, Definition of Packaging. Packaging Functions – Contain, Preserve, Protect, Inform, Identify, Sell. Types of – Rigid/ Semi- Rigid/ Flexible, Package, Packaging Classifications – Primary/ Secondary/ Tertiary/ Unit/ intermediate. Shelf Life of Package- Analysis and Evaluation.Markingsonpackage - Handling marks, routing marks, information marks. **Packaging Hazards:** Storage, Transportation, Chemical, Climatic, Biological hazards.

Unit-II

Package DESIGN: Design Fundamentals, Need for Changes in Package Design, Feature in Effective Design, Packaging Graphics and its importance, Package Colour and its importance. Graphic Design Elements – Significance of Shape, Size, Colour, Font, Texture, Lines, Balance & Unity, Symmetry & Harmony.
Product-Package Compatibility: Product Characteristics: Physical (Nature, Shape, Size, Texture, Centre of gravity, etc.), Chemical (Acidic, basic, reactivity etc.), Biological (Effect of micro-organisms) and Package Characteristics: Material (Plastic, paper, wood, etc.), Physical (Tensile, Breaking load, Burst, Molecular/ Fibre direction, etc.), Chemical (Unreacted chemicals present, pH, etc.), Biological (sensitivity to micro-organisms), Permeability (Barrier properties – Absorption/Diffusion of moisture and gases).

Unit-III

INTRODUCTION TO PACKAGES : Introduction toPapers and Board based Packaging– Coarse Paper, Fine Paper, Treated Paper, Laminated Paper, Advantages and limitations of paper board packaging materials, Folding Cartons, Set up Boxes, Corrugated Boxes, Multiwall paper sacks, Plastic woven Sacks, Paper Bags.

Unit-IV

Metal Packaging: Types of Metal Package, Mechanical Properties of Metal Container, Method of Manufacturing – Three piece Can, Two piece Can, Necked-in Can, Easy-Open Ends, Collapsible Tubes, aerosol Package, Metal foils, Laminates.**GlassPackaging:**Glass Packaging Forms, requirements of Glass Container, Coating in Glass Containers, Closures for Glass Containers, **WoodenPackaging:**Physical Characteristics of Wooden containers, Types of Wooden Boxes, Wooden Crates, Physical and mechanical properties of timber, Defects of timber, methods of preservation of timber.

Text & Reference Books:

1. **Fundamentals of Packaging Technology** by Soroka, IoPP, 2002.
2. **The Packaging User's Handbook Paine** by F. A., 1st Ed, Blackie Academic & Professional, 1991.
3. **Packaging Technology** Byett J. et al., 2nd Ed, The Institute of Packaging (SA), 2001.
4. **The Wiley Encyclopedia of Packaging Technology** by Yam K. L. Third Edition, Wiley, 2009.

Course Articulation Matrix:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	--	3	--	--	--	1	1	1	1	2	2	--
CO2	1	1	1	--	2	--	--	--	1	1	2	2	2	1	--
CO3	2	2	2	--	3	--	--	--	2	2	2	3	2	3	--
CO4	2	2	3	1	3	--	--	--	3	3	2	2	2	3	--
CO5	2	2	3	1	3	--	--	--	3	3	2	2	2	3	--

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PRINTED ELCTRONICS

General Course Information	
Course Code: PEC-PTG155-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To study and explain the various applications and areas of importance related to printed electronics.	L1
CO 2	To describe the various printing processes being used for printing of printed electronics products.	L2
CO 3	To discuss different substrates used for printed electronics.	L3
CO 4	To explain the printed electronics inks.	H1
CO 5	To analyse the different quality control aspects of printed electronics.	H2

Unit-I

Printed Electronics: Introduction, applications, advantages over conventional electronic devices, developments in printed electronics devices, industries and research associations, future scope. **Printing Processes:** Flexography, gravure, screen, inkjet, and pad printing, chemical etching and spin coating, technical parameters to improve the print quality.

Unit-II

Substrates: Paper and flexible substrates, surface treatment, gauge, strength, stiffness, chemical behavior, temperature and electrical properties, mechanism of ink drying on absorbent and non-absorbent substrates.

Unit-III

Inks: Polymer and water based conductive inks, properties - chemical, electrical and printability. influence of different inks on the electrical and magnetic characteristics of printed organic devices, nano technology - carbon nanotube and silver nanotube.

Unit-IV

Products and Quality Control: PCB, RFID, OLED, OFET, printed batteries, flexible display, smart packaging, photo detectors, solar cells - construction and working principles, calibration, characterization and standardization. quality control and measuring devices.

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code:Course Title: PRINTED ELECTRONICS															
Program Outcome (PO)													**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

PAPER TECHNOLOGY

General Course Information	
Course Code: PCC-PTG302-T Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-1-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To list various sources of fibrous and non-fibrous materials used in papermaking	L1
CO 2	To describe paper making process	L2
CO 3	To demonstrate various finishing operations used in papermaking	L3
CO 4	To examine various properties of paper	H1
CO 5	To evaluate suitability of paper for printing requirements	H2

UNIT-I

Paper Manufacturing: Sources of fibers, Fibre properties for paper requirements, Paper manufacture - Stage1 - pulp preparation, mechanical pulp, refiner mechanical pulp, thermo mechanical pulp, chemical processes-sulphate or Kraft process, sulphite process, combined chemical & mechanical process. Stage 2- stock preparation, non-fibrous additives, fillers or loading. Stage 3- refining the pulp, pulp freeness, refiners, pulp cleaning. Paper manufacturing process - paper making machine. Wet-end, Head box and slice. Fibre orientation. Angular flow. MD: CD ratio. Wire section. Forming wires. Press and drier sections.

UNIT-II

Finishing Operations and Recycling Process: Calendaring and Finishing- Hard calendaring, soft nip calendaring, super calendaring, machine glazing, paper coatings. Paper recycling process, Recycling importance and benefits, Problems in recycling, fibre preparation-screening, centrifugal cleaning, flotation, washing, deinking plant function, continuous drum

pulper, pre-screening and cleaning, primary flotation, cleaning, fine screening, thickening, dispersing, brightness control, washing, thickening and storage.

UNIT-III

Paper Requirements: Characteristics of paper. Printing process requirement. Paper varieties for printing. Printing defects associated with paper. Curling, wavy and tight edges, Problems with Picking, Blocking-in-the-pile, linting, dusting, powdering. Influence of moisture and RH on paper and boards. Paper storage – Requirement, Variables affecting paper storage. Print quality achievable on different types of paper, Measurement and calculations: Paper sizes.

UNIT-IV

Paper Properties and Printing Problems: Introduction, printability, runnability. Surface and directional properties of paper & board-substance, calliper, bulk, compressibility, surface smoothness/ roughness, air permeance, static and dynamic friction. Surface strength and internal bond strength - picking, fluffing, splitting. Strength properties - stiffness, folding endurance, bursting strength, tear resistance. Optical properties - gloss, brightness, whiteness, yellowness and tint indices, fluorescence, opacity.

Text & Reference Books:

1. Printing materials science & technology - Bob Thompson-PIRA
2. Materials in Printing Processes- LC Young
3. Printing materials-Prakash Sethi
4. Sheet-fed Offset Technology-Anjan Kumar Baral

Mapping of Course Outcome (CO) and Program Outcome (PO):

Course Articulation Matrix:

Course Code :PCC-PTG302-T						Course Title: Paper Technology								
	Program Outcome (PO)												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

PAPER TECHNOLOGY LAB

General Course Information	
Course Code: PCC-PTG302-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)**
	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Outline various paper testing instruments	L1
CO 2	Describe and understand working of paper testing instruments	L2
CO 3	To apply paper instruments knowledge in printing context	L3
CO 4	To examine various properties of paper	H1
CO 5	To select suitable instrument for paper testing purposes	H2

List of Experiments:

1. Study of Handmade Paper.
2. Study and Testing of GSM, Caliper and bulk of various paper and boards.
3. Study and Testing of Strength Properties (Tensile, Tearing and Bursting Strength)
4. Study and Testing of Moisture Content, Cobb (Water Absorbency), Curling, Ash content.
5. Study of finding CD and MD of various papers and boards.
6. Study of gloss and brightness of various papers.
7. Study of Light Fastness testing of various paper and card grades.
8. Rub resistance test for various papers.

Course Articulation Matrix:

Course Code :PCC-PTG302-P									**Course Title: Paper Technology Lab**						
	Program Outcome (PO)												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	3	1	1	2	3	2	1	3	3	3	2
CO2	3	2	1	2	3	2	1	2	3	3	2	3	3	3	2
CO3	3	2	2	1	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	1	3	3	2	3	1	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	2	3

PRINT FINISHING

General Course Information	
Course Code: PCC-PTG304-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe various binding materials used in printing	L1
CO 2	To explain various print finishing and binding operations	L2
CO 3	To use appropriate binding style for appropriate job	L3
CO 4	To differentiate numerous print finishing operations	H1
CO 5	To select appropriate materials during print finishing and book binding	H2

UNIT - I

Introduction: Binding, Print Finishing, book binding, classification of binding organization, latest developments in print finishing, importance of Book Binding **Book binding**: parts of book, Operations during bookbinding: pre-forwarding operations, forwarding operations, finishing operations. **Paper:** British Standard Paper Sizes, International Paper Sizes, RA & SRA Sizes. Advantages of ISO Paper Sizes. Regular and odd subdivisions of paper sizes, multiple sizes. Book **Binders Tools**: forwarding tools, finishing tools, **Binding Room Equipments**: - Laying Press, Standing Press, Sewing Frame, Glue Pot, Board Cutting. **Book**

Binders Materials: Board - kinds of boards. Reinforcing Materials. Securing Materials, Covering Materials, Adhesives- factors governing the choice of adhesives, use of adhesives in print finishing, effect of wet adhesives, theories of adhesives, principles of adhesives, solvent based adhesives, water based adhesives, pressure sensitive adhesives, types of adhesives, adhesion- physical, specific. Miscellaneous Materials.

UNIT – II

Pre- Forwarding Operations: Jogging, Counting, Cutting, Slitting, Trimming, Single knife guillotine machine: Paper cutting machine, **Folding**: Hand folding - folding to paper, folding to print, lump folding, style of folding, Binders Aids, Puckering, Folding Schemes, Machine Folding - knife principles, buckle principle, combination of knife & buckle, folding & machine direction, advancements & developments on folding machine, folding machine paper feeders, tips for smoother folding. **Tipping-in**, Attachment of Plates. **Gathering** - Single Sheet Gathering, In-setting, **Collating** - Collating Marks.

UNIT - III

Securing Methods: Wire Stitching, wire stitching machine, Thread Sewing - letterpress binding, & stationery binding, saddle sewing, side/flat sewing, French sewing, sewing on tapes, sewing on cords, sewing two sections on, whip sewing, stub-binding. Adhesive Binding/Perfect Binding – advantages, quality control in adhesive binding, lay-flat adhesive binding, Mechanical Binding - loose leaf binding - traditional styles used, spiral binding, wire 'o' binding, plastic comb binding, case binding.

End Papers: Purposes, Kinds of end Papers, Quality of Paper Required for Pasting End Papers. Pressing, Gluing the Spine, Smashing the Spine, trimming the Book Edges, Rounding- Advantages, Rounding Machine. Backing - Backing Machine. Lining - Advantages. Head-Tail Bands, Caps, Book Marker. Method of Attaching Head & Tail Bands. Covering - Covering Styles, Pasting Down, Pressing, Inspection.

UNIT - IV

Finishing Processes: Cover Decoration & Other Processes. Print Finishing Operations - embossing, debossing, blind embossing, gold blocking(foil stamping), die printing, thermography, velvet printing, marbling, varnishing, graining, laminating, gumming, gluing, punching, perforating, applique, Indexing, Edge Decoration - requirement, coloring the edges, marbling edges, edge guilding, round corner cutting. Numbering - folio numbering, double numbering, duplicate numbering, principle of rotary numbering, skip numbering, automatic numbering.

Binding & Finishing Machines: Study of Various Modern Machines, Modern Guillotines - Single Knife Guillotines, Three Knife Trimmers, Knife Grinding Machine. Gold Blocking/Foil Stamping Machine. Wire Stitching Machine. Laminating Machine, Smashing Machine. Back Gluing Machine. Roller Gliding Machine. Inline Rounding Machine. Lining Machine. Modern Lining Machine. Casing in Machine. Case Making Machine.

Text & Reference Books:

1. **Binding And Finishing - Ralph Lyman**
2. **Binding And Finishing Part-1 – BD Mendiratta**
3. **Binding Finishing Mailing - T. J. Tedesco**
4. **Introduction to Printing and Finishing - Hugh M Speirs**
5. **Finishing Process in Printing - A. G. Martin.**

Course Articulation Matrix:

Course Code: PCC- PTG304-T Nomenclature: PRINT FINISHING TECHNIQUES															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	2	2	1	--	--	--	1	2	1	2	1	2	--
CO2	1	2	1	2	1	--	--	--	2	2	1	3	1	2	--
CO3	1	1	2	2	3	--	--	--	2	1	2	2	2	2	--
CO4	2	2	1	3	2	--	--	--	1	2	3	2	2	2	--
CO5	2	2	2	3	1	--	--	--	2	2	1	3	2	2	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

PRINT FINISHING LAB

General Course Information	
Course Code: PCC-PTG304-P Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	To describe various binding materials used in printing	L1
CO 2	To explain various print finishing and binding operations	L2
CO 3	To use appropriate binding style for appropriate job	L3
CO 4	To differentiate numerous print finishing operations	H1
CO 5	To select appropriate materials during print finishing and book binding	H2

List of Experiments

1. Preparation of Saddle sewing booklet
2. Preparation of Side sewing booklet
3. Preparation of Centre stitched booklet
4. Preparation of Side stitched booklet
5. Preparation of quarter bound book by - French sewing method
6. Preparation of half bound book by -Tape sewing method
7. Preparation of half bound book by -Cord sewing method
8. Preparation of writing pad.
9. Preparation of Receipt books with numbers in duplicate & triplicate.
10. Preparation of following type of Mechanical binding - Spiral wire binding, Wire 'O' binding.

11. Study of various controls, operations and mechanisms of the following Machines: Folding Machine, Guillotine Machine, Cutter and Creaser, Varnishing Machine, Laminating Machine, Sewing & Stitching Machine, Miscellaneous Machine.
12. To study various print finishing operation used for print finishing and binding.

Course Articulation Matrix:

Course Code: PCC- PTG304-P Nomenclature: PRINT FINISHING LAB															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	2	2	1	--	--	--	1	2	1	2	1	2	--
CO2	1	2	1	2	1	--	--	--	2	2	1	3	1	2	--
CO3	1	1	2	2	3	--	--	--	2	1	2	2	2	2	--
CO4	2	2	1	3	2	--	--	--	1	2	3	2	2	2	--
CO5	2	2	2	3	1	--	--	--	2	2	1	3	2	2	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Printing Ink Technology

General Course Information	
Course Code: PCC-PTG306-T Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	**Course Outcomes** **At the end of the semester, students will be able to :**	**RBT Level**
CO 1	Describe concept of Printing Ink and its application.	L1
CO 2	Compare different Drying Mechanisms and their importance in printing and packaging	L2
CO 3	Understand different properties of Printing Inks	L3
CO 4	Comparison of different printing inks	H1
CO 5	Understand Radiation curing	H2
CO 6	Evaluate different print characteristics of Printing Inks	H3

UNIT-I

Introduction: Classification of inks- water based inks, solvent based inks. Ingredients in ink- Pigments- types and their properties, carbon black, inorganic pigments, organic pigments, physical characteristics of organic pigments. Vehicles- vehicles for liquid inks, vehicles for paste inks, UV curing vehicles.Additives- driers extenders, anti oxidents, waxes. Security inks.

UNIT-II

Drying Mechanisms:-Physical drying, absorption drying, chemical drying, oxidation polymerization drying, radiation drying and curing, Microwave drying, infrared drying.

UNIT-III

Properties of Inks :- Optical Properties of inks, Physical properties of Inks. Rheology of inks, Ink transfer requirements and ink distribution.

Viscosity - Newtonian flow, units of viscosity, viscosity & temperature, factors influencing viscosity, simple low viscosity inks, complex high viscosity inks. Ink requirements for printing processes – offset, letterpress, flexography, gravure, screen printing

UNIT-IV

Radiation Curing :-introduction, radiation curing inks, curing considerations, Chemistry of UV curing- photo initiation, propagation, termination. Cationic curing, electron beam curing.

Course Articulation Matrix:

Course Code: PCC- PKG301-T Nomenclature: Printing Ink Technology															
1: Low 2: Medium 3: High															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	--	--	2	1	--	--	--	1	1	--	1	1	2	--
CO2	1	1	2	2	1	--	--	--	1	1	1	2	1	1	--
CO3	1	--	1	1	3	--	--	--	3	2	2	2	2	3	--
CO4	2	2	1	2	2	--	--	--	2	1	2	2	1	2	--
CO5	2	1	1	2	2	--	--	--	2	1	1	2	1	2	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

PRINTING INKTECHNOLOGY LAB

General Course Information	
Course Code: PCC-PTG306-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of Printing Ink and its application.	L1
CO 2	Compare different Drying Mechanisms and their importance in printing and packaging	L2
CO 3	Understand different properties of Packaging Inks	L3
CO 4	Comparison of different printing inks	H1
CO 5	Evaluate different print characteristics of Packaging inks Inks	H2
CO 6	Understand various chemicals used in Printing	H3

List of Experiments:

Various samples of Paper and their study.

2. Different samples of Inks and their study.
3. Lightfastness test.
4. Machine Direction and Cross Direction of paper.
5. Effect of Humidity and Temperature on paper.
6. Ink tackiness Test.
7. Printed samples of different printing processes and their study.

8. Ink Viscosity Test.

9. Introduction to various chemicals used in printing.

Course Articulation Matrix:

Course Code: PCC- PKG301-T Nomenclature: PRINTING INK TECH. LAB															
1: Low 2: Medium 3: High															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	--	--	2	1	--	--	--	1	1	--	1	1	2	--
CO2	1	1	2	2	1	--	--	--	1	1	1	2	1	1	--
CO3	1	--	1	1	3	--	--	--	3	2	2	2	2	3	--
CO4	2	2	1	2	2	--	--	--	2	1	2	2	1	2	--
CO5	2	1	1	2	2	--	--	--	2	1	1	2	1	2	--
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SCHEME & SYLLABUS

B.TECH.
(PRINTING TECHNOLOGY)
4th year
w.e.f.Session- 2019-20

CREDIT BASED SYSTEM
(70:30)

Guru Jambheshwar University of Science and Technology
Hisar - 125001
(Haryana)
(Established by State Legislature Act 17 of 1995)
'A' GRADE NAAC ACCREDITED UNIVERSITY

7th Sem

B. TECH (PRINTING TECHNOLOGY)

Subject Area	Subject Code	Subject Name	Teaching Schedule			Credits
			L	T	P	
PE-2	BTPT-701-L	(A) Packaging Design (B) Security Printing & Holography	4	-	-	4.0
PC-16	BTPT-702-L	Packaging Techniques and Processes	3	-	-	3.0
PC-17	BTPT-703-L	Quality Assurance & Control	3	-	-	3.0
PC-18	BTPT-704-L	Print Entrepreneurship Development	3	1	-	3.5
PC-19	BTPT-705-L	Colour Management Systems	3	-	-	3.0
PC-20	BTPT-706-L	Printing Organization and Layout Designing	3	-	-	3.0
PC-16	BTPT-702-P	Packaging Techniques and Processes Lab	-	-	3	1.5
PC-17	BTPT-703-P	Quality Assurance & Control Lab	-	-	3	1.5
PC-19	BTPT-705-P	Colour Management Systems Lab	-	-	3	1.5
PW-4	BTPT-707	Industrial Training Presentation-II	-	2	-	N.C.
PW-5	BTPT-708	Project Work-I	-	-	2	1
Total			19	3	11	25
Total (Overall)			**33**			**25.0**

8th Semester

Subject Area	Subject Code	Subject Name	Teaching Schedule			Credits
			L	T	P	
PE-3	BTPT-801-L	Newspaper and Magazine Technology	3	-	-	3.0
PE-4	BTPT-802-L	Printing Maintenance Engineering	3	1	-	3.5
PE-5	BTPT-803-L	Total Quality Management	3	1	-	3.5
PE-6	BTPT-804-L	Continuous Stationary Printing	3	-	-	3.0
PE-4	BTPT-802-P	Printing Maintenance Engineering Lab	-	-	3	1.5
PE-5	BTPT-803-P	Total Quality Management Lab	-	-	3	1.5
PW-6	BTPT-805	Project Work-II	-	9	9	9.0
Total			12	11	15	25
Total (Overall)			**38**			**25.0**

PACKAGING DESIGN

General Course Information	
Course Code: BTPT-701-L (A) Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4/week, (L-T-P:4-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objective: This subject introduces both functions and forms of packaging design. It will help the students in the field of designing, visual communication and advertising. It will lead to successful designing and provides a guide to generate digital files for prepress.

UNIT-I

Total concept for packaging, functions of packages, types of packages, factors influencing the design / selection of package, Fundamentals of design: line, tone, value, weight, texture, shape, size, space, etc. Principles of design- balances, proportion, rhythm, unity, contrast, simplicity, fitness. **New concepts and concern in packaging design.**

UNIT-II

Colour theory, dimension of colour, colour schemes, colour symbolism, emotional effects of colour.

Division of design: natural, conventional, decorative, geometrical and abstract. Printing planning: rough layout, comprehensive, artwork, type of originals, sizing, mashing and cropping.

UNIT-III

Computer pre requisites for graphic designing, Bit, Types of bits and computers, Grayscale and colour Channel, Pixel, Bit depth, Introduction of various software used for designing. Selection of an appropriate printing process for printing of a job, Pdf and types of Pdf's.

UNIT-IV

What is 3D? Visualizing three dimensional effects, from 2D drawings. Perspective: sense of perspective drawing. Understanding of scale and sense of proportion, **3D designing and software.**

Course Outcome: This course will enable the students

1. To work with design softwares.
2. To study the concepts and understanding of design fundamentals.
3. To apply the knowledge of commercial design.
4. Knowledge about the advance technologies in design and modeling.

Text & Reference Books:

1. The Designer's Handbook by Alistair Campbell
2. Design & Technology by Van No strand
3. Handbook of Advertising Art Production by Schelmmer.
4. Art & Production by N.N.Sarkar.
5. Advertising, Art & Production by J. Nath.

SECURITY PRINTING AND HOLOGRAPHY

General Course Information	
Course Code: BTPT-701-L (B) Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4/week, (L-T-P:4-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Objective: A variety of specialty and security printing product are made for commercial use like mailer, integrated cards, flyer and envelopes and security product like currency notes, postage stamps, cheques etc. Producing specialty items require special equipments and adjustment of machineries, for security products it requires special materials. Students will be able to know the above things. Student should have prior knowledge of printing process, printing materials science, printing press and accessories.

Outcomes: At the end of the course, learners should be able to;

1. Analyze & describe the fundamental concepts in Security printing.
2. Produce specialty printing items, equipments involved, incorporating security features etc., and also use of special materials like substrate, inks etc.
3. Elaborate the importance of security printing with respect to use in everyday documents.

Unit-I

Security Printing: Introduction to security Printing**, Document security, Brand Protection, Lottery tickets, Tax stamps**. Importance of security printing of bank note papers and boards, passports and government documents. UV-visible Printing, rainbow printing, micro lines, guilloches, numbering, Line-printing, stamp embossing, hot-foil-embossing, embossing / punching, fibers, hologram, solvent color, multi color UV-fluorescence stitching thread, holographic foil or lamination of a page, Digital Watermark.

Unit-II

Security printing materials, Types of security inks-Speciality inks -UV, water based, polymer, metallic, nano, thermo setting inks., Infrared inks, photochromatic inks, Invisible inks, UV fluorescing, water fugitive, solvent sensitive inks, combifuge, Fluorescent Inks, security papers-MICR, NMICR, uncoated, toner fused paper, Special papers, Techniques In Security Printing-Watermark –Technique, Micro printing, Security threads, Magnetic ink, Anti - copying marks , Fluorescent dyes. Serial number-Application of serial numbering, Serial number arithmetic, Magnetic ink character recognition, Different printing processes-Intaglio, Letterpress, Dry offset, Simultan presses, Intaglio (print making).

Unit-III

Security Products: Credit Cards, Smart cards, club cards, credit / debit cards, Plastic ID cards, Water mark cards, RFID technology, Bar codes, Printers used for bar codes. Cheques, security paper, Security colour, Printing process, Quality control, products of security printing- Paper currency, Securities, Postage stamps, Other products of security printing. Security features of various products- Clear window, Polymer substrate, See – through registration device, Shadow image, Intaglio Printing, Background Print (offset), Micro printing, Fluorescent Ink properties, Design, Printing, Security. MICR/OCR/Cheque printing technology Counterfeit, fraud prevention, Cheque fraud prevention, method and arrangement for processing negotiable instruments. First line inspection of documents using optical elements such as Holograms, optical variable graphics, diffraction structures, liquid crystal materials, optical security in laminates etc. invisible document security and Brand protection.

Unit –IV

Security printing in packaging- RFID, Bar-coding, Foils, High resolution borders, Micro printing. Security packaging, Facts on counterfeiting, Security printing, Barcode and reader, Scanner/ Symbology interaction, Publishing barcode types, Material types- Poly asset – Extra durable, Poly break – Destructible, Poly check, Tamper evident seals, Poly void, Barcode uses, Retail barcodes, Packaging barcodes, Current developments, Barcodes for non – retail labels.

Modern Security Techniques like Holography: - Holography- Overview and History, How it works, Physics of Holography. Hologram, Types of Hologram- Dot matrix, CLR (convert laser readable) image, Computer Synthesized 2D/3D images, True Colour images, E – BEAM & 12,000 dpi, Holographic reconstruction process, Hologram recording process.

Texts / References:

1. "Computer Stationery and MICR Cheque Production" Association for research and development in printing, Madras

2. "Hand Book of Printing Technology" EIRI Board of Consultants and Engineers, Engineers India Research Institute, New Delhi

3. "Bank Credit Card Business" Indian Institute of Bankers (1999), Macmillan, Delhi

4. "Introduction to security printing" Richard D. Warner and Richard M.Adams II, PIA GATF Press

5. "Handbook of Print Media", H Kipphan, Springer – VetagBzlin Heidelberg, 2001

PACKAGING TECHNIQUES AND PROCESSES

General Course Information	
Course Code: BTPT-702-L Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Objectives:

1. Understand the concept of systems& online Packaging techniques.
2. Understand the various machineries used for conversions of different packaging materials.
3. Study the different packaging machineries used for line operations and systems.
4. Study various ancillary equipments used apart from packaging machineries.
5. Understand the importance of testing, online & offline equipment's used industries.
6. To study different package processing and its techniques
7. To know suitable processing technique as per the end product

Outcomes: At the end of the course, learners should be able to;

1. Suggest the packaging material use and its conversion as per the product geometry.
2. Suggest the filling machine required for the line operations.
3. Choose the ancillary machineries required in the line operations based on the product to be packed.
4. Analyze the different conveying system used for various line operations.
5. Select different online and offline testing methods that are required during the converting operations or on the packaging lines.

UNIT-I

Introduction and Manufacturing Metals Cans & Drums Introduction, Machineries used for conversion, online packaging, system packaging, Ancillaries Machines and equipment, Online and Offline inspection equipment. Metal Cans-Three piece, DRD & DWI can manufacturing machine and its various sections-Coating Equipments. Metal drum-Types-Different machines used in manufacturing. Fibre& Composite drum-Drum types-Machine used in manufacturing.

Innovative Packaging Techniques/Processes: Gas packaging - MAP & CAP, Vacuum packaging, shrink packaging, stretch wrapping, blister packaging, skin packaging, strip packaging, Aerosol packaging container, working principle. Injection Blow Moulding, Extrusion blow

moulding, Extrusion. Injection Molding, Compression molding, Thermo forming. Vacuum forming, Pressure forming, Matched mould forming.

UNIT-II

Machineries for Manufacturing of Sacks, Cartoning, Flexible Laminates & Corrugated Box Sacks-Types-Machine used in manufacturing of bag-Synthetic sack-Types-Manufacturing machine. Folding Cartons -Cartoning-Types of Cartons-Machine used in cartoning. FlexibleLaminates-Types of lamination techniques-Different components of the Lamination Machine. Corrugated Box-Board construction-Machine used in manufacturing.

Types of fillers, VFFS, HFFS, Multiwall Sack filling Filling machineries by count-Filling machineries-Liquid-Carbonated, Still-Design consideration and selection of fillers. Types of Solid fillers-Cup, Weight, Auger, Multi-head weigher Vertical Form fill seal (VFFS), Horizontal Form fill seal (HFFS) Machines-Machine overview, Types-Different section on the machine-New technologies available. Multiwall bag-Types of filling technique.

UNIT-III

Aseptic System, Retort System Packaging of Drugs & Pharmaceuticals Retort System-Overview-Process description, Canning Operation-Type of Retort system& machines/equipments. Aseptic System-Concept- Types of Aseptic Packs-Aseptic Packaging Machineries based on sterilization method.

Blister & Strip Packaging, Case packing Machines, Blister Packaging-Blister Design Parameters-Types of Blisters, Sections on Blister packaging machines. Strip Packaging-Strip packaging process-Materials used-Strip Packing Machinery Case packing or Case loading- Case loading Methods-Machine used in case packing.

UNIT-IV

Wrapping Machines, Ancillary Machines &Equipments Wrapping Machine-Style of wrapping-Machines used Shrink Wrapping Machine-Machine types and its parameters Stretch Wrapping Machine-Pre stretching film-Types of Wrapper models. Label Applicator Machines-Capping Machines-Sealing machines-Coding & Marking machines-Stencilling-Taping machine-Strapping machine-Slitting machine.

Conveying, Buffering &Accumulating Systems and Online &Offline Testing machines Introduction-Integration of Conveyor-Design and Installation of Conveyor systems-Conveying systems-Power transmission components-Transfer between conveyors-Interconnecting machinery Online Inspection machine used on packaging lines. Offline Testing machine-Packaging Materials, Shipping Packages

Texts / References:

1. Davis, C.G., Introduction to Packaging Machinery, Packaging Machinery Manufacturers Institute.

2. Luciano, R., How to Write Packaging Machinery Specifications, Institute of Packaging Professionals

3. Zepf, P.J., Improving Packaging Line Performance, Institute of Packaging Professionals

4. G. K. Dubey, Fundamentals of Electric Drives, Narosa Publishing house

5. Dr. J. S. Rao and Dukhipeti, Theory of M/cs and Mechanisms, New Age International

6. H. P. Garg, Industrial Maintenance, S.Chand

7. Kit L Yam,The Wiley Encyclopedia of Packaging Technology, John Wiley & Sons Inc. Publication, 2009

8. F A Paine, The Packaging User's Handbook, Blackie Academic & Professional, 4th Reprint, 1996

9. Kaushik, Chaurasia&Dhakar, "Textbook of Pharmaceutical Packaging Technology", CBS Publishers & Distributors Pvt. Ltd, 1st Edition, 2009

10. EIRI Board of Consultant & Engineer, "Handbook of Packaging Technology", Engineers India Research

QUALITY ASSURANCE AND CONTROL

General Course Information	
Course Code: BTPT 703-L Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P: 3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives

1. To give the students comprehensive knowledge of quality control in printing industry
2. To introduce various raw material testing related knowledge to the students.

Unit-I

Definition of Quality, Quality control, its meaning, objective, and functions, Quality Cost, economic consideration, Quality Assurance, Comparative study of quality control and quality assurance, Benefits of Quality Control in Printing Industry

Unit-II

Quality Control as an attitude and management tool, Quality Circle, Total Quality Control. House and Pillars of TQM, Quality Control procedures and methods, Acceptance Sampling and Statistical Quality Control

Unit-III

Establishing Quality control programme in different departments of Printing organization. Introduction to ISO:9000 and ISO:14000 series. QMS and EMS, ISO 12647 Paper and paper board testing instruments for testing printability, print quality and end-use requirements

Unit-IV

Ink testing instruemtns for testing optical and working properties and end-use requirements Process control instruments, Quality Control Strip, Press sheet control devices used for production of multi-colour printing jobs Basic principles of these instruments and devices how they function and what they measure, minimum instrumentation necessary to produce a product consistent with the appropriate quality level.

Course Outcomes

1. Students will be able to understand quality principle in a deeper level.
2. Students will be able to control the quality of raw materials.

Recommended Books:

1. W.H. Banks, Inks, Plates and Print Quality, Pergamon Press

2. Quality Control for quality printing, Graphic Arts, Technical Foundations.

PRINT ENTREPRENEURSHIP DEVELOPMENT

General Course Information	
Course Code: BTPT 704-L Course Credit: 3.5	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P: 3-1-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives

1. To give the students comprehensive knowledge of entrepreneurship development
2. To introduce various entrepreneurial skills in the students

Unit-I

Entrepreneurship- Definition, Types of Entrepreneurs**,** qualities and pre-requisites of entrepreneur, Entrepreneurship spirits, Significance of entrepreneur in Economic Development, Economic, social and psychological need for entrepreneurship, Identifying & Evaluating Business opportunities.

Unit-II

Quick Start Method: Methods and Procedures to start and expand one's own business, Franchises, creating your own franchise, Multilevel marketing schemes, Buying an existing business.

Unit-III

Business Planning Process: Why is a good business plan required? Business Plan-the major benefits, sub plan, Business plan-blue print to success and financing, Small manufactures business plan, Feasibility Report, Project Reports.

Unit-IV

Forms of Ownership: Different forms of ownership-sole proprietorship, partnership, joint stock company, Selling, Selling your venture, planning for succession, Valuation of a business, Responsibility of a good employer, Risk management, Entrepreneurship development programmes, Role of Govt. and promotional agencies in entrepreneurship development

Course Outcomes

1. Students will be able to understand various qualities required for being successful entrepreneur.
2. Students will be able to get deeper knowledge of business planning process required for entrepreneurship development.

Recommended Books :

- Entrepreneurship Development - Colombo Plan Staff College for Technician Education.
- Entrepreneurship Development & Management - **Jose Paul, N. Ajith Kumar**.
- Entrepreneurship Development Programmes& Practices - **Jasmer Singh Saini**.

COLOR MANAGEMENT SYSTEMS

General Course Information	
Course Code: BTPT-705-L Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P: 3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objective: This course will teach students how to use effective colour management to work with high standards. Students will learn how to improve the workflow systems, to deliver consistent reproduction of high quality files.

UNIT-I

Colour management – Introduction, WYSIWYG, and need for colour management, Three Cs of color management, colour management systems, colour management workflow, models of colour management, Color Spaces - device dependent and independent color spaces. Additive colour and subtractive colour

UNIT-II

Colour and Vision: Light as electromagnetic radiations, visible spectrum, light source, sample spectrum, changing the illuminant, human vision and vision and measurement.

UNIT-III

Introduction to many color management concepts- Rendering intents, Profiles, gamut, IT8 charts , LAB and ICC. Profile –Making software. Define CIEilluminants and standard light sources, Color Temperature, metamerism, memory colour. Define Delta E. Demonstrate how to calculate it and how to use it.

UNIT-IV

Basic attributes of colour: Hue, Value, Chroma. Colour density, dot gain, trapping, tone value, UCR, GCR, colour control strips and punch register system, dot area measurement.

Measuring Instruments: Working of Densitometer, colorimeter and spectrophotometer, Describe CIE colour system including XYZ, Yxy, LAB and LCH.

Course Outcomes:

This course is ideal for designers and printers who managecolour file workflow and management.By the end of the course students will have confidence in colour work, and be best positioned to deliver an excellent service to Industries.

Text & Reference Books:

1. Colour Control in Lithography by Kelvin Tritton.
2. Understanding Color Management by Abhay Sharma
3. Art & Production by N.N. Sarkar.
4. Printing Technology by Adams, Faux, Rieber, 5th Edition

PRINTING ORGANIZATION AND LAYOUT DESIGNING

General Course Information	
Course Code: BTPT-706-L Course Credit: 3	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

PO: This subject will include thoroughly knowledge about various printing organization and layout. This includes:

1. Brief knowledge about print organization and management
2. Information about various plant layouts in printing industry
3. Thorough knowledge about plant layout procedure
4. Knowledge about press building

Unit- 1

Printing Organization:
Management: Nature scope and importance of Management, Functions of Management –Scientific, Management. Production and operations Management – Locations and Layout of plant, Maintenance management
Management Structure – Structure of organization, Formal and Informal organization, Market research, Sales promotion and Purpose of business management. Work flow and organizational structure in a printing press,

Unit- 2

Plant Layout: Objectives of good plant layout, principles of plant layout, importance of plant layout, situations in which layout problem may arise, factors influencing plant layout, Methods of plant and factory layout-operation process chart, flow process chart, flow diagrams, string diagrams, machine data cards, templates three dimensional models, correlation chart,

Types of plant layout -Product layout or live layout, process layout or functional layout, combination layout, static layout or fixed position layout. Symptoms of bad layout. flow pattern-line flow, L type flow, circular flow, U type flow, S or inverted S combination of U and line flow pattern. Characteristics and place of application. Factors governing flow patterns: Combination of line flow

and S type of pattern. Combination of line flow and circular type. Processing upwards. Retration type, inclined flow. Workstation design-Storage Space requirements.

Unit- 3

Plant layout procedure: Accumulate basic data, Analysis and coordinate basic data, decide the equipment and machinery required, Select the material handling system, sketch plan of the plot for making factory building. Determine a general flow pattern, Design the individual workstation. Assemble the individual layout into the total layout calculate storage space required, Make flow diagrams In work stations and allocate them to areas on plot plan, Plan and locate service areas, make master layout. Check final layout, Get official approval of the final layout, install the approved layout.

Unit- 4

Factory Building (Press Building): Introduction, Advantages of a good factory building, Factors affecting the factory building - nature of manufacturing process-flexibility-expandability-service facilities-employee facilities-lighting-heating-ventilating-air conditioning-appearance- durable construction-security measures-noise control. Types of factory building - single story building, high bay and monitor type buildings, multi storey buildings, building of special types.

Comparison between single-story and multi-story building. Types of construction of factory building Wood frame construction, Brick construction, slow burning mill construction, Steel frame construction, Reinforced concrete construction, Pre-cast concrete construction. Specific parts of factory building- roof, walls, floor.

Recommended Books :-

1. T.A. Saifuddin – Management aspects of printing industry by Nirmal Sadanadn Publishers, Mumbai, Ist edition.
2. G.G. Field- Printing Production Management by Graphic Arts Publishing, 1996.
3. R.D. Aggarwal-Organisation and Management-Tata McGraw Hill Publishing Ltd., New Delhi
4. Facility layout and location-**Richard L.Francis, John A. White**.
5. Computer Aided Production Management - **Mahapatra**
6. Production and Operations Management - **Mchelmann Oakland, Lockyer**
7. Practical Plant Layout - **Herold B.Maynard**
8. Industrial Engineering Management System- **Dr. S. Dalela, Dr. Mansoor Ali**
9. Industrial Engineering & Management - **O. P. Khanna**
10. Industrial Engineering and Production Management-**M. Mahajan**.
11. Materials handling for Printer - **A. John Geis, Paul L. Addy**.

PACKAGING TECHNIQUES AND PROCESSES LAB.

<table>
<tr><th colspan="2">General Course Information</th></tr>
<tr><td rowspan="2">Course Code: BTPT-702-P

Course Credit: 1.5

Contact Hours: 3/week, (L-T-P:0-0-3)

Mode: Lectures and Tutorials

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.</td></tr>
<tr><td>For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.</td></tr>
</table>

OBJECTIVES: To develop awareness about the different package processing & its techniques and also know suitable processing technique as per the end product

List of Experiments:

1. Understand the concept of systems& online Packaging techniques.
2. Understand the various machineries used for conversions of different packaging materials.
3. Study the different packaging machineries used for line operations and systems.
4. Study various ancillary equipments used apart from packaging machineries.
5. Understand the importance of testing, online & offline equipment's used industries.
6. Study different package processing and its techniques
7. Familiarizing the suitable processing technique as per the end product

OUTCOMES: At the end of the course, learners should be able to suggest the packaging material use and its conversion as per the product geometry, and also choose the ancillary machineries required in the line operations based on the product to be packed.

QUALITY ASSURANCE AND CONTROL LAB

General Course Information	
Course Code: BTPT – 703-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical & Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

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List of Experiments –

1. GSM, Caliper, Checking grain direction.
2. Tensile strength of paper, burst strength of paper.
3. Cobb sizing value test.
4. Tearing testing of paper, brightness test of paper.
5. Gloss test, Ash Content Tester
6. Folding endurance, Standard Viewing of Print
7. Curl Testing
8. Hot air oven tester
9. Pick strength testing
10. Measurement of viscosity of ink, tack measurement for ink

COLOR MANAGEMENT SYSTEMS LAB

General Course Information	
Course Code: BTPT-705-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

List of Experiments

1. Electronic colour separation.
2. Study of flatbed scanner.
3. Study of colour drum.
4. Study of manual colour separation technology.
5. Study of UCR.
6. Study of GCR.
7. Study of Masking.
8. Study of colour density instruments.

INDUSTRIAL TRAINING PRESENTATION-II

<table>
<tr><td colspan="2">General Course Information</td></tr>
<tr><td rowspan="2">Course Code: BTPT-707

Course Credit: - Non-Credit

Contact Hours: 2/week, (L-T-P:0-2-0)

Mode: Tutorials

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</td></tr>
<tr><td>For the end semester examination, the presentation will be done by the students and Viva-Voce examinations will be conducted by External Examiner (preferably from Industry).</td></tr>
</table>

For industrial exposure of the students to the latest technology and to make them understand the workflow in the industry, training in the Industry forms a compulsory and significant aspect. Students will be trained in industry for a period of 3 weeks during the earlier semester vacations. Their performance will be periodically assessed by the staff in charge from the department and a coordinator industry. After completion of the training period the students will submit a detailed report. There will be a viva-voce at the end of the training and grades will be awarded. The areas of training during these periods will be in different branches of printing and packaging.

PROJECT WORK – I

General Course Information	
Course Code: BTPT-708 Course Credit: 1 Contact Hours: 2/week, (L-T-P:0-0-2) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

The Concept of Project will be started by a group of maximum ten students under the guidance of project guide (Faculty member)

NEWSPAPER AND MAGAZINE TECHNOLOGY

General Course Information	
Course Code: BTPT-801-L Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

PO: This subject will include thoroughly knowledge about News Paper and Magazine Technology. This includes:

1. Keen knowledge about various News Paper Magazine Technology
2. Thorough knowledge about Magazine Technology

Unit – 1

Introduction to Newspaper organization Newspaper Hierarchy - editorial organization, souces of news; mechanical aspects of newspaper organization -composition, printing the newspaper, basic operations business aspects of newspaper organization, flow charts of staff in newspaper organization, Circulation and Advertisement departments, distribution channels. Policy of a newspaper. Headlines. History and their significance. Functions of headlines, kickers, blurbs. The grammar of headlines. Unit count in headlines. Treating photographs; croping. Captions for photographs.

Unit- 2

Basics of Design The aesthetics of desing. Achieving symmetry/asymmetry, balance/off-balance, use of colour, place ment of various elements in design **Modern concepts of design**. The written word and illustration. Principles of adapting content to form. Attracting attention. Newspaper layout & designing Difference between design and layout. The various kinds of layout. The importance of visual appeal in page- making. Playing up/down a story. Colour, boxing, verbal and non-verbal languages in design. Graphics/diagrams and illustrations and their importance. **New trends in newspaper advertisements.**

Unit- 3

Flow of stories into a newspaper office The various sources and copy for each page. Reporters, correspondents, agencies, syndicates, columnists, readers. Fascimiles copy & photographs. Editorial content and news. The OP-ED page. The gatekeeping function.

Unit- 4

Editorial Organization Newspaper Publishing Sources of news wire services, syndicates The role of copy editors, city editors, news editors, editorial cartoonist, artists, sunday editors, sports editor, business editor, journalist & reporters, Information to a printer by editor.

Recommended Books:-

News Reporting and writing - Melvin Mecher

The Journalist; Handbook - M. V. Kamath

Editing; A Handbook for Journalists - TJS George

Editing; A Handbook for Journalists - TJS George, Indian Institute of Mass communication, Delhi.

Telling Stories, Taking Risks - Klement/Mataline

Journalism in India - R. Parthasarathy

Headlines and Deadlines - Baskette, Floyd

PRINTING MAINTENANCE ENGINEERING

<table>
<tr><th colspan="2">General Course Information</th></tr>
<tr><td rowspan="2">Course Code: BTPT-802-L

Course Credit: 3.5

Contact Hours: 3/week, (L-T-P:3-1-0)

Mode: Lectures and Tutorials

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.</td></tr>
<tr><td>For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.</td></tr>
</table>

PO: This subject will include thoroughly knowledge about maintenance of printing machines. This includes:

1. Keen knowledge about various drive and control systems used in printing machine
2. Thorough knowledge about erecting and testing
3. Thorough knowledge about repair and reconditioning of various parts
4. Thorough knowledge about maintenance procedure.

Unit - 1

Drive and Control Systems: Transmission systems such as AC and DC motors, belt, chain, gear, cranks, connecting rods, paul and ratchet mechanisms, Hydraulic, Pneumatic, Electrical, Electronic and mechanical controls.

Unit- 2

Erecting and Testing: Equipment needed for erection - selection of location and environmental conditions - erection procedure for various prepress printing and finishing equipments and machinery - loading and transport of raw materials and printed product with respect to layout design- commissioning.

Unit- 3

Repairs and Reconditioning: Principles of reconditioning -repair methods for various parts - Roller copperizing and re-rubberising - ebonite covering damping and inking systems - paper transport systems and feeder head.

Cylinders, Bushes and Bearings: Cylinder construction - testing run out and taper - cylinder bearing supports - eccentric bushes - removal and fixing of bushes - changing of oil seals maintenance of bushes and bearings.

Unit- 4

Maintenance procedures: Need and importance of maintenance - Definition, types, Maintenance policies - Maintenance organization – Maintenance of pumps and compressor - Lubricants, their types and Characteristics, Lubricating methods - Central lubrication with return oil Manual lubricating Greases, oils, Greases, oils, grades - preventive maintenance, break down maintenance.

Identification & rectification of faults. Maintaining different types of Letterpress, Offset, Gravure and Flexography Machines.

Recommended Books:-

1. Electrical Engg. By B.L. Thareja Part I & II
2. Theory of Machines By Khurmi & Gupta S.Chand Publisher New Delhi

TOTAL QUALITY MANAGEMENT

<table>
<tr><th colspan="2">General Course Information</th></tr>
<tr><td rowspan="2">Course Code: BTPT-803-L

Course Credit: 3.5

Contact Hours: 3/week, (L-T-P:3-1-0)

Mode: Lectures and Tutorials

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.</td></tr>
<tr><td>For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.</td></tr>
</table>

Course Objectives

1. To facilitate the complete knowledge of total quality management fundamentals and its implications in the industry
2. To understand the deeply the various tools and techniques of Total Quality Management

UNIT- I

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM, Barriers to TQM – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention, Cost of Quality

UNIT- II

TQM Leadership – Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT- III

The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT- IV

Quality Circles – Cost of Quality – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures. ISO 9000 and ISO 14000 Series

Course Outcomes

- The TQM principles, tools and techniques will help to enhance the productivity in manufacturing and servicing industry.

Books:

- Dr. V. Jayakumar and Dr. R. Raju, "Total Quality Management".

CONTINUOUS STATIONARY PRINTING

General Course Information	
Course Code: BTPT-804-L Course Credit: 3.0	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objective: To make students aware about the role of continuous stationary, its form and security aspects in daily life.

UNIT-I

Introduction: Trends in the Computer Forms stationery - Demands for the computer forms, **Designing of Computer forms:** Basic designs of various types of forms for input and output - Fan fold forms, Computer letters and Mailers, Computer envelopes, Snap-out-forms, Tags and labels, Computer envelope, MICR Cheque etc., Typography - designing of forms with computer based machines

UNIT-II

Paper used for the Production of forms: Specifications, requirements, storage conditions, etc., Carbon papers - varieties, specifications and manufacturing process **Manufacture of computer forms:** Different types of Web-Offset Printing Presses. Construction and configuration-on-line operations such as numbering, perforating, punching and Zig-Zag folding

UNIT-III

Finishing Machines for computer forms: Different types of collators - Roll to Roll -Roll to pack and pack to pack-Programmable outers for continuous web-MICR cheque binding system. Machines used for packing and Dispatch.

Computers for Designing: Introduction to Computer in Design, Desktop Publishing software, Capabilities, Equipments required for Desktop Publishing, Software types: Word processing software, Spreadsheet applications, Graphics software, Object-oriented drawing software, Paint-oriented graphics, and Layout software, Salient features of different DTP Software, Uses, Applications, Advantages and Limitations.

UNIT-IV

Security aspects in Continuous Stationary: Concept of Security printing, printing processes used for Security printing, Unique characteristics offered by different printing processes and types of job suitability, Advantages of security printing.

Materials for Security Printing: Security inks and its types, Security paper substrates and its types, **Modern aspects of Security Printing**: - Security prints as an Innovative Technology, RFID Technology, QR Code and Holography

Course Outcomes:

This course will be helpful for the students: -

1. Acquainted with the Continuous stationary and its form
2. Security aspects in association with Continuous stationary
3. Utility of computer for Continuous stationary

Recommended Books:

1. **Introduction to Security Printing** By Richard D. Warner and Richard M.Adams II
2. **Handbook of Print Media** By H Kipphan, Springer – Vetag Bzlin Heidelberg, 2001
3. Forms for the 80"s. How to design and produce them - **Gar Raines**
4. Stochastic Screening - **Kelvin Tritton**.
5. **Art & Production** by NN Sarkar

PRINTING MAINTENANCE ENGINEERING LAB

General Course Information	
Course Code: BTPT-802-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

List of experiments:-

1. Study of AC and DC motor
2. Study of Transmission system
3. Study of roller copperising
4. Study of roller rubberizing
5. Maintenance of cylinders
6. Maintenance of gear system of printing machine

TOTAL QUALITY MANAGEMENT LAB

General Course Information	
Course Code: BTPT-803-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3) Mode: Practical and Lab Work Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

List of Experiments:

1. To make Quality Circle and understanding its implications
2. Case study of TQM in Corrugation Industry
3. Case study of TQM in Printing Industry
4. Case Study of TQM in Packaging Industry
5. Six sigma implementation in Printing and Packaging industry
6. Kaizen Approach in Printing Industry
7. QFD (Quality Function Deployment) applications in Packaging Industry
8. Practical approach to ISO 9000 implementation
9. Practical approach to ISO 14000 implementation
10. Case study of employee involvement in decision making in various packaging organizations

PROJECT WORK – II

<table>
<tr><th colspan="2">General Course Information</th></tr>
<tr><td rowspan="2">Course Code: BTPT-805

Course Credit: 9

Contact Hours: 3/week, (L-T-P:0-9-9)

Mode: Practical and Lab Work

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</td></tr>
<tr><td>Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.</td></tr>
</table>

Project will be an innovative working model of machine/equipments used in Printing Industry with required modifications and will be demonstrated during examination with the help of project report by a group of maximum ten students under the guidance of project guide (Faculty member)