

SCHEME & SYLLABUS

B. TECH.

(PRINTING TECHNOLOGY)

w.e.f. Batch (2021-25) Onwards



Guru Jambheshwar University of Science and Technology

Hisar - 125001

(Haryana)

(Established by State Legislature Act 17 of 1995)

'A' GRADE NAAC ACCREDITED UNIVERSITY



Department Of Printing Technology
Guru Jambheshwar University of Science & Technology
Hisar – 125001

Scheme & Syllabus of B. Tech. — Printing Technology, w.e.f. Session 2021-2025

Vision

To develop Department of Printing Technology, Guru Jambheshwar University of Science & Technology as a center of excellence for quality Teaching & consultative research in the areas of Printing Technology to Produce competent technocrats for the Printing & Allied Industries.

Mission

To facilitate and promote studies and research in the areas of Printing Technology and also to achieve excellence in this field.

Programme Specific Outcomes (PSOs)

PSO1: To prepare the students to understand printing systems, subsystems, components and processes to address technical and engineering challenges.

PSO2: To empower the student to build up career in printing and allied industry or pursue higher studies in printing and allied/interdisciplinary program.

PSO 3: To enhance the skills of the students with the ability to implement the scientific concepts for betterment of the society considering ethical, environmental and social values.



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Scheme & Syllabus of B. Tech. — Printing Technology, w.e.f. Session 2021-2025

B. Tech. (Printing Technology)

Program Educational Objectives (PEOs)

PEO1	Apply technical skill and professional knowledge in engineering practices to face industrial challenges around the world.
PEO2	To prepare the students to lead a successful career in printing and allied industries or to pursue higher studies or to support entrepreneurial endeavors.
PEO3	Inculcate effective team work, moral ethics and leadership with ability to solve societal problems.

Program Educational Objectives (PEOs)

PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex printing and related engineering problems.
PO2	Problem Analysis: Identify, formulate, research literature, and analyze complex printing and related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design/Development of Solutions: Design solutions for complex printing and related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex printing and related engineering activities with an understanding of the limitations.
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.



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PO7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.
PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Lifelong Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

ज्ञानं विज्ञान सहितम्

Scheme & Syllabus
for
B. Tech.
(Printing Technology)
2nd Year (3rd Semester)

Scheme B. Tech. (Printing Technology) III- Semester, W.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Basic Science Courses	BSC-PTG201-T	--	Applied Sciences for Printing	3	0	0	3.0	--	3.0	30	70	100	
2.	Engineering Science Courses	ESC-PTG201-T	--	Engineering Science for Packaging	3	0	0	3.0	--	3.0	30	70	100	
3.	Professional Core Courses	PCC-PTG201-T	PCC-PTG201-P	Pre-Press Technology	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
4.	Professional Core Courses	PCC-PTG203-T	PCC-PTG203-P	Introduction to Printing Processes	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
5.	Professional Core Courses	PCC-PTG205-T	PCC-PTG205-P	Graphic Design in Printing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
6.	Professional Core Courses	PCC-PTG207-T	--	Content Management in Printing	3	0	0	3.0	--	3.0	30	70	100	
7.	Mandatory Courses	MC103-T	--	Indian Constitution	3	0	0	0.0	--	0.0	30	70	100 (Qualifying Only)	
					21	0	9							
Total Credits										22.5	Total Marks= 900			

APPLIED SCIENCES FOR PRINTING

General Course Information	
SEMESTER-III Course Code: BSC-PTG201-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To provide the comprehensive knowledge of basic science for applications in various printing processes and equipments used in the industry.
- To enhance skills and attitude towards the technical aspects related to printing.
- To understand the concept of science behind printing.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Outline comprehensive knowledge of science in printing arena.	L1
CO 2	Classify technical parameters of printing materials	L2
CO 3	Examine knowledge of press room environment in printing organization	L3
CO 4	Detect suitable instrument for maintaining print standard.	H1
CO 5	Distinguish various surface properties in context of printing	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. **Prakash Sethi**, Printing Materials, MJP Publishers, Kindle Edition, 2014
2. **H. Kippan**, Handbook of Print Media, Springer, 1st Edition, 200
3. **Bob Tompson**, Printing Materials, Leatherhead : Pira International, 2nd Edition, 2004
4. **Jain and Jain**, Engineering Chemistry, Dhanpat Rai Publishing Company; 16th Edition (1 January 2015)
5. **NIIR Board**, Complete Technology book on Printing Inks, Delhi : Asian Pacific Business Press, 1st Edition, 2006
6. **Herbert Holik**, Hand Book of Paper and Board, Wiley-VCH, 2006

Course Articulation Matrix:

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

ENGINEERING SCIENCE FOR PACKAGING

General Course Information	
SEMESTER-III 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; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To provide the comprehensive knowledge of basic engineering material and science related to various print applications in printing industry.
- To enhance skills and attitude towards the engineering science related aspects related to printing innovations.
- To apply the engineering knowledge for various technical aspects of printing.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Define various raw materials used in printing and packaging industry	L1
CO 2	Describe the utilization of paper, inks and other chemicals in printing and packaging industry	L2
CO 3	Explain principles of engineering and sciences in the field of printing and packaging industry	L3
CO 4	Identify most inclusive areas where various materials can be used in printing and packaging industry	H1
CO 5	Appraise various adhesives and their utilization in Printing & Packaging Industry	H2

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. **Prakash Sethi**, Printing Materials, MJP Publishers, Kindle Edition, 2014
2. **H. Kippan**, Handbook of Print Media, Springer, 1st Edition, 200
3. **Bob Tompson**, Printing Materials, Leatherhead : Pira International, 2nd Edition, 2004
4. **Jain and Jain**, Engineering Chemistry, Dhanpat Rai Publishing Company; 16th Edition (1 January 2015)
5. **NIIR Board**, Complete Technology book on Printing Inks, Delhi : Asian Pacific Business Press, 1st Edition, 2006
6. **Herbert Holik**, Hand Book of Paper and Board, Wiley-VCH, 2006

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	-	1	-	-	1	1	1	3	2	1	
	CO 2	3	3	3	1	1	-	-	-	-	-	1	1	3	3	1	
	CO 3	3	3	2	-	1	-	1	-	1	-	1	1	3	2	1	
	CO 4	3	3	2	-	1	-	-	-	-	-	1	1	3	2	2	

PRE – PRESS TECHNOLOGY

General Course Information	
SEMESTER-III 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; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To understand the comprehensive knowledge of computer technology for pre-press applications in printing industry.
- To apply the computer domain knowledge in Printing & Packaging industry.
- To have in-depth knowledge of various software used in Printing & Packaging industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Label and draw various hardware and software components of computer	L1
CO 2	Explain the utilization of various displays for pre-press technology	L2
CO 3	Apply principles of DTP in the field of pre-press technology	L3
CO 4	Compare various types of software and images used in pre-press	H1
CO 5	Identify the 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 Top Publishing- 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. **Adams, Faux, Rieber**, Printing Technology, Delmar Publications, 5th edition, 2002
2. **H. Kippan**, Handbook of Print Media, Springer, 1st Edition, 200
3. **Hugh Speirs**, Introduction to Prepress, Pira International, 2nd Edition, 2003
4. **Ambrose/ Harris**, The Graphic Design Handbook, New York : Fairchild Books, 2nd Edition, 2016
5. Friedl.E, Typography – when, who & how, Köln : Könemann, 1st Edition, 1998
6. **Frank Cost**, “Pocket guide to digital Printing”, Delmar Publishers, 1997.

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	3	2	2	-	-	-	-	-	-	-	1	2	2	2	1
	CO 2	3	2	2	-	-	-	-	-	-	-	1	2	2	2	1
	CO 3	3	3	2	-	3	-	-	-	-	-	2	2	2	3	1
	CO 4	3	2	3	-	-	-	-	-	-	-	2	1	2	3	1
	CO 5	2	3	-	-	-	-	-	-	-	-	2	2	3	2	1

PRE – PRESS TECHNOLOGY LAB

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC- PTG201-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of computer technology for pre-press applications in printing industry.
- Hands-on experience of computer for designing of various templates.
- Experience of various DTP software for graphic design used in Printing & Packaging industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Draw various hardware and software components of computer	L1
CO 2	Explain the utilization of various hardware devices for pre-press technology	L2
CO 3	Generalize practical implications of DTP in the field of pre-press technology	L3
CO 4	Compare various types of images used in pre-press	H1
CO 5	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	3	2	2	-	-	-	-	-	-	-	1	2	2	2	1
	CO 2	3	2	2	-	-	-	-	-	-	-	1	2	2	2	1
	CO 3	3	3	2	-	3	-	-	-	-	-	2	2	2	3	1
	CO 4	3	2	3	-	-	-	-	-	-	-	2	1	2	3	1
	CO 5	2	3	-	-	-	-	-	-	-	-	2	2	3	2	1

INTRODUCTION TO PRINTING PROCESSES

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC- PTG203-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To have basic knowledge of major printing processes.
- To learn the technical aspects of printing processes.
- To have conceptual knowledge of various products printed by major printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define printing and its applications	L1
CO 2	Explain various printing processes	L2
CO 3	Examine merits and demerits of printing processes	L3
CO 4	Distinguish image carriers of various printing processes	H1
CO 5	Determine various printing process defects and their remedies	H2

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. **Adams, Faux, Rieber**, Printing Technology, Delmar Publications, 5th edition, 2002
2. **Anjan Kumar Baral**, Sheet-fed Offset Technology, Arihant Publication, January 1, 2010
3. **C.S. Misra**, Letter Press Printing, Allahabad [Anupam](#), 1st Edition, 1992
4. **[Raymond N. Blair](#)**, Lithographers Manual, Printing Industries Pr; 9th edition (1 January 1994)
5. **C. S. Mishra**, Sheet-fed Offset, Anupam prakashan, 1992
6. "Flexography : Principles & Practices", 5th Edition, FTA, 2000.
7. FIRST: Flexographic Image Reproduction Specifications & Tolerances", 3rd Edition, FTA, 2003.

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	2	1	1	-	-	1	-	-	-	1	1	3	2	1	
	CO 2	3	2	1	-	1	-	-	-	-	-	1	1	3	3	1	
	CO 3	3	2	1	-	-	-	-	-	-	-	1	1	3	3	1	
	CO 4	3	2	2	-	-	-	-	-	1	-	1	1	3	2	2	
	CO 5	3	2	2	1	-	-	-	-	-	-	1	1	3	3	2	

INTRODUCTION TO PRINTING PROCESSES LAB

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC-PTG203-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To have basic practical knowledge of major printing processes.
- To learn the technical aspects of printing processes practically.
- To have conceptual knowledge of various products printed by major printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define printing and its applications	L1
CO 2	Explain various printing processes	L2
CO 3	Examine merits and demerits of printing processes	L3
CO 4	Distinguish image carriers of various printing processes	H1
CO 5	Determine various printing process defects and their remedies	H2

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.

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	2	1	1	-	-	1	-	-	-	1	1	3	2	1																			
	CO 2	3	2	1	-	1	-	-	-	-	-	1	1	3	3	1																			
	CO 3	3	2	1	-	-	-	-	-	-	-	1	1	3	3	1																			
	CO 4	3	2	2	-	-	-	-	-	1	-	1	1	3	2	2																			
	CO 5	3	2	2	1	-	-	-	-	-	-	1	1	3	3	2																			

GRAPHIC DESIGN IN PRINTING

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC-PTG205-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:

- To introduce the basic elements of graphics design for applications in Printing Industry.
- To know the basics of designing, communication and advertising for various print applications.
- To apply the principles of design for designing of various printing products for different processes.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to :	RBT Level
CO 1	Describe graphic design concept	L1
CO 2	Recognize colour importance in printing	L2
CO 3	Use different graphics design softwares	L3
CO 4	Identify numerous perspective drawings	H1
CO 5	Determine typographical parameters meant for graphic design	H2

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. **Adams, Faux, Rieber**, Printing Technology, Delmar Publications, 5th edition, 2002
2. **H. Kippan**, Handbook of Print Media, Springer, 1st Edition, 200
3. **Ambrose/ Harris**, The Graphic Design Handbook, New York : Fairchild Books, 2nd Edition, 2016
4. Friedl.E, Typography – when, who & how, Köln : Könemann, 1st Edition, 1998
5. **N.N. Sarkar**, Art and Production , New Delhi : Oxford University Press, 2nd Edition, 2013

Course Articulation Matrix:

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

GRAPHIC DESIGN IN PRINTING LAB

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC-PTG205-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:

- To get practical understanding of basic elements of graphics design for applications in Printing Industry.
- Practical exposure of basics of designing, communication and advertising for various print applications.
- Hands-on experience to learn the principles of design for designing various printing products for different processes.

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 fundamentals	L1
CO 2	Describe graphics designing attributes in printing	L2
CO 3	Use various softwares for developing design	L3
CO 4	Create various designs for printing and packaging	H1
CO 5	Distinguish various package designs for different applications	H2

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	3	1	1	--	1	--	--	--	1	--	1	2	2	2	1
CO2	3	1	1	--	1	--	--	--	1	--	1	2	2	1	1
CO3	2	2	2	--	1	--	--	--	2	1	2	3	2	3	1
CO4	3	2	1	--	--	--	--	--	--	--	--	--	2	2	1
CO5	3	2	1	--	--	--	--	--	--	--	--	--	2	2-	1

CONTENT MANAGEMENT IN PRINTING

General Course Information	
<p>SEMESTER-III</p> <p>Course Code: PCC-PTG207-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To understand about basics and importance of content management.
- To understand the numerous applications of CMS in the field of printing.
- Finding appropriate CMS for various print applications.

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	Interpret 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	Detect 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**

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	1
CO2	1	1	1	--	--	--	--	--	--	--	--	1	1	1	1
CO3	2	2	2	--	2	--	--	--	1	1	1	2	2	1	1
CO4	1	1	1	1	--	--	--	--	--	1	--	--	2	1	1
CO5	2	2	2	3	3	--	--	--	--	--	1	2	2	1	1

Scheme & Syllabus
for
B. Tech.
(Printing Technology)
2nd Year (4th Semester)

Scheme B. Tech. (Printing Technology) IV- Semester, W.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Basic Science Courses	BSC-PTG202-T	-----	Applied Science for Packaging Materials	3	0	0	3.0	00	3.0	30	70	100	
2.	Professional Core Courses	PCC-PTG202-T	PCC-PTG202-P	Technology of Flexography	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
3	Professional Core Courses	PCC-PTG204-T	PCC-PTG204-P	Methodology of Composition in Printing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
4	Professional Core Courses	PCC-PTG206-T	PCC-PTG206-P	Techniques of Printing Image Generation	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
5.	Mandatory Courses	MC-104-T	--	Essence of Indian Traditional Knowledge	3	0	0	0.0	--	0.0	30	70	100 (Qualifying Only)	
					15	0	09							
Total Credits										16.5	Total Marks= 700			

Note- At the end of the IV-semester each student would undergo 4-6 weeks practical training in an industry/research laboratory. For the same, the assessment will be held with 5th Semester Examinations. For the detailed guidelines regarding industrial training, presentation, evaluation students may go through the guidelines mentioned at PROJ-PTG301-P (Industrial Training Presentation-I) in Scheme and Syllabus of 5th Semester.

APPLIED SCIENCE FOR PACKAGING MATERIALS

General Course Information	
SEMESTER-IV Course Code: BSC-PTG202-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To provide the comprehensive knowledge of material science related to printing and packaging applications.
- To explore various materials used for various packaging applications.
- To explore about various new generation packaging materials for eco-friendly applications.

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	Explain the comprehensive knowledge of various packaging materials	L2
CO 3	Interpret technical knowhow required for different packages.	L3
CO 4	Identify appropriate materials and its importance for packaging applications	H1
CO 5	Determine eco-friendly alternatives of packaging	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. **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	2	2	2	1	1	-	-	-	-	-	1	1	3	2	1
CO2	3	2	1	-	-	-	-	-	-	-	--	1	3	2	1
CO3	3	1	1	-	-	-	-	-	-	-	--	1	2	2	1
CO4	2	1	2	-	1	1	-	-	-	-	--	--	2	2	1
CO5	2	2	2	-	-	2	1	-	-	-	--	1	2	2	1

TECHNOLOGY OF FLEXOGRAPHY

General Course Information	
<p>SEMESTER-IV</p> <p>Course Code: PCC-PTG202-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To impart knowledge of basics of flexographic printing process.
- To understand mechanical and technical aspects of flexographic printing machines.
- To have better understanding of operations and applications of flexographic printing in modern era.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	Define various tools and techniques used in flexographic print production	L1
CO 2	Describe the flexographic printing process, flexo presses and their markets in the current scenario	L2
CO 3	Apply Quality Control in flexographic printing workflow	L3
CO 4	Examine most inclusive areas where flexography printing used in printing industry	H1
CO 5	Identify printing challenges in flexographic printing	H2

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 right 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 & REFERENCE BOOKS:

1. “Flexography : Principles & Practices”, 5th Edition, FTA, 2000.
2. “FIRST: Flexographic Image Reproduction Specifications & Tolerances”, 3rd Edition, FTA, 2003.
3. Frederick R.Boyle, “The Flexo Environment”, Foundation of Flexographic Technical Association, 2002.
4. Anthony White, “High Quality Flexography”, Pira reviews of Printing, Pira International, 1992.
5. Donna C.Mulvihill, “Flexography Primer”, GATF Press, 1991.
6. Helmut Kipphan, “Handbook of Print Media”, Springer Verlag, 2001
7. J.Michael Adams David, Fauz, Llyod, J.Rieber, “Printing Technology”, 5th Edition, Delmar Publishers, 1988
8. Herbert L. Weiss, Flexography Proficiency, Converting Technology Corp.
9. 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	-	1	-	1	-	-	-	1	1	3	2	2	
CO2	3	2	1	-	1	-	-	-	-	-	2	1	3	2	1	
CO3	3	2	2	-	1	-	-	-	-	-	1	2	3	2	1	
CO4	2	2	2	-	-	-	-	-	-	-	2	2	3	3	1	
CO5	2	2	2	-	-	-	1	-	-	-	2	2	3	2	1	

TECHNOLOGY OF FLEXOGRAPHY LAB

General Course Information	
<p>Semester-IV</p> <p>Course Code: PCC-PTG202-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical and Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of flexographic printing process.
- To provide hands-on experience of flexographic printing machines.
- To provide learning for operations of various components for running flexographic printing presses.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able T0:	RBT Level
CO 1	Define various practical tools and techniques used in flexographic print production	L1
CO 2	Describe the practical utilization of flexographic printing process, plate preparation methods and flexo presses	L2
CO 3	Clarify various procedures adopting for flexographic printing	L3
CO 4	Examine the trouble shoot on flexography machine	H1
CO 5	Evaluate the various tests on flexographic prints.	H2

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	2	1	-	1	-	1	-	-	-	1	1	3	2	2
CO2	3	2	1	-	1	-	-	-	-	-	2	1	3	2	1
CO3	3	2	2	-	1	-	-	-	1	-	1	2	3	2	1
CO4	2	2	2	-	-	-	-	-	-	-	2	2	3	3	1
CO5	2	2	2	-	-	-	1	-	-	-	2	2	3	2	1
CO6	2	2	1	-	1	-	1	-	-	-	1	1	3	2	2

METHODOLOGY OF COMPOSITION IN PRINTING

General Course Information	
<p>Semester-IV</p> <p>Course Code: PCC- PTG204-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To understand about the basics of digital composition for Printing, Packaging & Publishing domains.
- To understand basic typesetting phenomenon, working and their importance.
- To have hands-on experience of various software used for composing used in Printing, Packaging & Digital domains.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define various tools and techniques used in print composition	L1
CO 2	Describe the utilization of composition software and DTP in printing	L2
CO 3	Apply principles of composition in the field of printing industry	L3
CO 4	Examine most inclusive areas where DTP, imagesetters and computer can be used in printing industry	H1
CO 5	Evaluate usages of modern composition tools used in printing	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, tele communications, modems, ISDN. General rules of page make up. Page orientations, Preparing copy for press, text and graphics combination.

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. Adams, Faux, Rieber, Printing Technology, Delmar Publications, 5th edition, 2002
2. H. Kippan, Handbook of Print Media, Springer, 1st Edition, 2000
3. Hugh Speirs, Introduction to Prepress, Pira International, 2nd Edition, 2003
4. Frank Cost, “Pocket guide to digital Printing”, Delmar Publishers, 1997.

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 Outcomes (CO)	CO 1	2	1	1	-	-	-	-	-	-	-	1	1	3	2	1
	CO 2	2	2	1	-	-	-	-	-	-	-	1	2	3	2	1
	CO 3	2	1	-	-	-	-	-	-	-	-	1	2	3	3	1
	CO 4	2	1	-	-	-	-	-	-	-	-	-	2	3	2	1
	CO 5	2	1	-	-	-	-	-	-	-	-	1	1	3	3	1

METHODOLOGY OF COMPOSITION IN PRINTING LAB

General Course Information	
<p>Semester-IV</p> <p>Course Code: PCC- PTG204-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical and Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of digital composition for Printing, Packaging & Publishing domains.
- To understand basic typesetting phenomenon, working and their importance.
- To have hands-on experience of various software used for composing used in Printing, Packaging & Digital domains.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various practical tools and techniques used in print composition	L1
CO 2	Explain the practical utilization of composition software and DTP in printing	L2
CO 3	Use and demonstrate composition methods in the field of printing industry	L3
CO 4	Examine most inclusive practical areas where DTP, image-setters and computer can be used in printing industry	H1
CO 5	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. MS 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.
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	1	3	2	1
	CO 2	2	2	1	-	-	-	-	-	-	-	1	2	3	2	1
	CO 3	2	1	-	-	-	-	-	-	-	-	1	2	3	3	1
	CO 4	2	1	-	-	-	-	-	-	-	-	-	2	3	2	1
	CO 5	2	1	-	-	-	-	-	-	-	-	1	1	3	3	1

TECHNIQUES OF PRINTING IMAGE GENERATION

General Course Information	
<p>Semester-IV</p> <p>Course Code: PCC –PTG-206-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of printing Image Generation for different printing processes.
- To understand technical concepts of image generation for different printing processes.
- Finding appropriate image generation method for conventional printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define various tools and equipments used in Plate making department.	L1
CO 2	explain various plate making techniques for different printing processes.	L2
CO 3	apply the concepts related to various machines and tools in plate making department.	L3
CO 4	compare the different concepts and principles for plate making techniques.	H1
CO 5	Differentiate 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.

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, MacDonal & 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	2	2	1	-	-	1	-	-	1	-	1	1	3	2	1
CO2	2	2	-	-	-	-	-	-	-	-	1	1	3	3	1
CO3	2	2	1	-	-	-	-	-	-	-	1	1	3	2	1
CO4	1	2	2	-	-	-	-	-	-	-	-	1	3	3	1
CO5	3	2	1	-	-	1	-	-	-	-	1	1	3	2	1

TECHNIQUES OF PRINTING IMAGE GENERATION LAB

General Course Information	
<p>Semester-IV</p> <p>Course Code: PCC-PTG206-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical and Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart practical knowledge of printing Image Generation for different printing processes.
- To learn and practice about various parameters of image surfaces for runnability of image carriers different printing machines.
- To provide hands-on experience for generating image surfaces for different printing processes.

Course Outcomes: -

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

List of Experiments:-

1. Applications of various materials and equipment used in Printing Image Generation Department.
2. Assembling positives for four colour jobs
3. Layout preparation
4. Preparation of Wipe-on plates.
5. Preparation of Albumin plates
6. Preparation of Deep-etch plates.
7. Preparation of Pre-sensitized plate
8. Gripper margin and registration processes
9. Preparation of Flexographic plates
10. Preparation of Gravure Cylinder
11. Preparation of Digital Plates
12. Stencil 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	2	2	-	1	-	-	-	-	-	1	1	3	2	1
CO2	3	1	1	-	-	-	-	-	-	-	-	1	3	2	1
CO3	3	2	1	-	1	-	1	-	-	-	-	1	3	2	1
CO4	3	1	1	-	-	-	-	-	-	-	1	1	3	2	1
CO5	3	2	1	-	1	-	-	1	-	-	-	1	3	2	1

Scheme & Syllabus
for
B. Tech.
(Printing Technology)
3rd Year (5th Semester)

Scheme B. Tech. (Printing Technology) V- Semester, W.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Open Elective Courses	OEC-I	-----	Open Elective Course-I	3	0	0	3.0	--	3.0	30	70	100	
2.	Humanities, Social Sciences and Management Courses	HSMC302-T	-----	Fundamental of Management for Engineers	2	0	0	2.0	--	2.0	30	70	100	
3.	Professional Core Courses	PCC-PTG301-T	PCC-PTG301-P	Sheet-fed Offset Technology	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
4.	Professional Core Courses	PCC-PTG303-T	PCC-PTG303-P	Colour Analysis & Reproduction Technology	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
5.	Professional Core Courses	PCC-PTG305-T	PCC-PTG305-P	Technology of Gravure	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
6.	Project Work	--	PROJ-PTG301-P	Industrial Training Presentation-I	0	0	2	--	1.0	1.0	30	70	100	
7.	Mandatory Courses		MC-PTG301-P	Technical Presentation/Seminar	0	0	2	0.0	--	0.0	30	70	100 (Qualifying Only)	
					14	0	13							
Total Credits										19.5	Total Marks:- 900			

OEC- I

Student will select one subject from the list of course available in OEC-I list. Subject will be offered from concerned department (other than Department of Printing Technology).

General Course Information	
<p>Semester-V</p> <p>Course Code: OEC-I</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <hr/> <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

SHEET FED OFFSET TECHNOLOGY

General Course Information	
<p>Semester-V</p> <p>Course Code: PCC- PTG301-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of basics of sheet-fed offset printing process.
- To understand mechanical and technical aspects of sheet-fed offset printing machines.
- To have better understanding of operations and applications of sheet-fed offset printing in modern era.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:-	RBT Level
CO 1	explain the various categories of offset press and the principles behind it.	L1
CO 2	describe the various units of a sheet fed offset press.	L2
CO 3	examine the functioning of five units of the offset press.	L3
CO 4	point out various print trouble shooting in sheet fed offset presses.	H1
CO 5	assess the various print quality factors and their applications.	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. Applications of various standards (IS & ISO) in offset press organizations.

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**.

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	-	-	-	-	-	1	1	3	2	1
CO2	3	2	1	-	2	-	-	-	-	-	2	2	3	2	1
CO3	3	2	2	-	2	-	-	-	-	-	3	3	3	3	2
CO4	3	3	1	-	-	-	1	-	-	-	2	2	3	2	1
CO5	3	3	3	-	2	-	1	-	-	-	2	2	3	3	1

SHEET FED OFFSETTECHNOLOGY LAB

General Course Information	
<p>Semester-V</p> <p>Course Code: PCC- PTG301-P Course Credit: 1.5 Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of sheet-fed offset printing process.
- To provide hands-on experience of sheet-fed offset printing machines.
- To provide learning for operations of various components for running sheet-fed offset printing presses.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	list the various categories of offset press and the principles behind it.	L1
CO 2	summarize the various units of a sheet fed offset press.	L2
CO 3	demonstrate the functioning of five units of the offset press.	L3
CO 4	identify the various print trouble shooting in sheet fed offset presses.	H1
CO 5	evaluate the various print quality factors and their applications.	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	-	-	-	-	-	1	1	3	2	1	
CO2	3	2	1	-	2	-	-	-	-	-	2	2	3	2	1	
CO3	3	2	2	-	2	-	-	-	-	-	3	3	3	3	2	
CO4	3	3	1	-	-	-	1	-	-	-	2	2	3	2	1	
CO5	3	3	3	-	2	-	1	-	-	-	2	2	3	3	1	

COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY

General Course Information	
<p>Semester-V</p> <p>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</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of colour measurement and analysis for different print domains.
- To understand the technical concepts of reproduction technology for different printing processes.
- Finding appropriate reproduction technology for various printing methods.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	describe basic principles of reproduction photography	L1
CO 2	summarize comprehensive knowledge of halftone to continuous tone originals	L2
CO 3	interpret technical knowhow required for auxiliary exposures	L3
CO 4	compare the basic principles of line separations	H1
CO 5	distinguish 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, commercial manufacture of ccd's, construction of ccd, ccd application, ccd cameras for the professional photographic market, colour resolution. 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	3	2	1	-	2	-	2	-	1	1	1	1	3	2	1
CO2	3	2	1	-	2	-	-	-	-	-	2	2	3	2	1
CO3	3	2	2	-	2	-	-	-	-	-	3	3	3	2	1
CO4	3	3	1	-	-	-	1	-	-	1	2	2	3	2	1
CO5	3	3	2	-	2	-	1	-	-	-	2	2	3	2	2

COLOUR ANALYSIS & REPRODUCTION TECHNOLOGY LAB

General Course Information	
<p>Semester-V</p> <p>Course Code: PCC-PTG303-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart practical knowledge of colour measurement and analysis for different printing domains.
- To learn and practice about various parameters of reproduction technology.
- To provide hands-on experience of operating various machines used for colour analysis and reproduction technology.

Course Outcomes: -

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

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	1	1	1	1	1	1	-	-	-	1	1	3	2	1
CO2	3	2	1	-	2	-	-	-	-	-	2	2	3	2	1
CO3	3	2	2	-	2	-	-	-	-	-	3	3	3	3	2
CO4	3	3	1	-	1	-	1	-	-	-	2	2	3	2	1
CO5	3	3	3	1	2	-	1	-	-	-	2	2	3	3	1

TECHNOLOGY OF GRAVURE

General Course Information	
<p>Semester-V</p> <p>Course Code: PCC-PTG305-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of basics of Gravure printing process.
- To understand mechanical and technical aspects of Gravure printing machines.
- To have better understanding of operations and applications of Gravure printing in modern era.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the Gravure Printing, its market in India & abroad.	L1
CO 2	Explain about Gravure Printing & Presswork	L2
CO 3	Generalize Gravure Printing substrates, inks and environmental consideration and safety	L3
CO 4	Identify about Gravure machine and components with their importance & handling.	H1
CO 5	Determine the deep understanding of various major components and their considerations for advance applications and printing of multi-colour jobs.	H2

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 of impression 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.

Text and Reference Books: -

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	3	2	1	1	2	1	2	-	1	1	1	1	3	2	1
CO2	3	2	1	1	2	-	-	1	-	-	2	2	3	2	1
CO3	3	2	1	-	2	1	-	-	-	-	3	3	3	3	1
CO4	3	3	1	-	-	-	1	-	-	-	2	2	3	2	1
CO5	3	3	1	-	2	-	1	-	1	-	2	2	3	3	1
CO6	2	2	1	1	2	-	-	-	-	1	1	1	3	2	1

TECHNOLOGY OF GRAVURE LAB

General Course Information	
<p>Semester-V</p> <p>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</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of Gravure printing process.
- To provide hands-on experience on Gravure printing machines.
- To provide learning for operations of various components for running Gravure printing machines along with minimizing print defects.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the Gravure Printing, its market in India & abroad.	L1
CO 2	Explain about Gravure Printing & Presswork	L2
CO 3	Generalize Gravure Printing substrates, inks and environmental consideration and safety	L3
CO 4	Identify about Gravure machine and components with their importance & handling.	H1
CO 5	Determine the deep understanding of various major components and their considerations for advance applications and printing of multi-colour jobs.	H2

List of Experiments:

1. Appraise of 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. Doctor Blade assembly and setting on Machines.
8. 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	3	2	1	1	2	1	2	-	1	1	1	1	3	2	1
CO2	3	2	1	1	2	-	-	1	-	-	2	2	3	2	1
CO3	3	2	1	-	2	1	-	-	-	-	3	3	3	3	1
CO4	3	3	1	-	-	-	1	-	-	-	2	2	3	2	1
CO5	3	3	1	-	2	-	1	-	1	-	2	2	3	3	1
CO6	2	2	1	1	2	-	-	-	-	1	1	1	3	2	1

INDUSTRIAL TRAINING PRESENTATION - I

General Course Information	
<p>Semester-V</p> <p>Course Code: PROJ-PTG301-P</p> <p>Course Credit: 1.0</p> <p>Contact Hours: 3/week, (L-T-P:0-0-2)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)</p> <p>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).</p>

Course Objectives: -

- To evaluate the industrial exposure of students gone for industrial training after 4th Semester.
- To inculcate presentation skills (Verbal and Non-verbal) among the students.
- Enhance technical and communication skills of the students regarding recent developments in Printing and Packaging Industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe the importance of technical terms used in printing industry.	L1
CO 2	Illustrate the technical terms with relevance.	L2
CO 3	Discover the art of preparation of technical presentations	L3
CO 4	Prepare the art deliver technical presentations	H1
CO 5	Appraise the technical and communication skills of the students.	H2

Guidelines: - 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 4-6 weeks during the earlier semester vacations. Their performance will be periodically assessed by the faculty incharge from

the department and industry coordinator. 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 printing/packaging/print buying/print selling/technical sales of printing consumables, ink and paper/service and maintenance/customer support.

Course Articulation Matrix:

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

TECHNICAL PRESENTATION/SEMINAR

General Course Information	
c	Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)
Course Code: MC-PTG301-P	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).
Course Credit: 0.0 (Non-Credit)	
Contact Hours: 3/week, (L-T-P:0-0-2)	
Mode: Practical & Lab Work	
Examination Duration: 3 Hours	

Course Objectives: -

- To inculcate presentation skills (Verbal and Non-verbal) among the students on various technical topics related to Printing & Packaging industry.
- Enhance technical and communication skills of the students regarding recent developments in Printing and Packaging Industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	List the importance of technical terms used in printing industry.	L1
CO 2	Explain the technical terms with their practical relevance.	L2
CO 3	Classify the art of preparation of technical presentations	L3
CO 4	Point out the art to deliver technical presentations	H1
CO 5	Justify technical and communication skills of the students.	H2

Guidelines: -

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 and faculty guide/supervisor.

Course Articulation Matrix:

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

Scheme & Syllabus
for
B. Tech.
(Printing Technology)
3rd Year (6th Semester)

Scheme B. Tech. (Printing Technology) VI- Semester, W.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Open Elective Courses	OEC-2	-----	Open Elective Course-II	3	0	0	3.0	--	3.0	30	70	100	
2.	Program Elective Courses	PEC-1	-----	Program Elective Course-I	3	0	0	3.0	--	3.0	30	70	100	
3.	Humanities, Social Sciences and Management Courses	HSMC301-T	-----	Economics for Engineers	2	0	0	2.0	--	2.0	30	70	100	
4.	Professional Core Courses	PCC-PTG302-T	PCC-PTG302-P	Paper Technology	3	1	3	4.0	1.5	5.5	T	30	70	100
											P	50	50	100
5.	Professional Core Courses	PCC-PTG304-T	PCC-PTG304-P	Print Finishing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
6.	Professional Core Courses	PCC-PTG306-T	PCC-PTG306-P	Printing Ink Technology	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
Total Credits										22.5	Total Marks: - 900			

Note- At the end of the VI-semester each student would undergo 4-6 weeks practical training in an industry/research laboratory. For the same, the assessment will be held with 7th Semester Examinations. For the detailed guidelines regarding industrial training, presentation, evaluation students may go through the guidelines mentioned at PROJ-PTG405-P (Industrial Training Presentation-II) in Scheme and Syllabus of 7th Semester.

Program Elective Course –I (PEC-I)	
Course Code	Course Name
PEC-PTG151-T	Newspaper & Multimedia
PEC- PTG152-T	Substrates for Printing
PEC- PTG153-T	Printing Organizations & Plant Layout
PEC- PTG154-T	Introduction to Packaging
PEC- PTG155-T	Printed Electronics
Any one MOOC course not studied earlier (or to be studied as per scheme)	

OEC- II

Student will select one subject from the list of course available in OEC-II list. Subject will be offered from concerned department (other than Department of Printing Technology).

General Course Information	
<p>Semester-VI</p> <p>Course Code: OEC-II</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

PEC-I (PROGRAM ELECTIVE COURSE- I)

Student will select one subject from the list of course available in PEC-I list PEC-PTG151-T/ PEC-PTG152-T/ PEC-PTG153-T/ PEC-PTG154-T/ PEC-PTG155-T. Subject will be offered from the department of printing technology. Detailed syllabus is attached here with. As per the letter vide No. COE/2019 189-212 dated 30.08.2019, to offer any program elective course 30% of class strength is mandatory in UG programs.

NEWSPAPER AND MULTIMEDIA

General Course Information	
<p>Semester-VI</p> <p>Course Code: PEC-PTG151-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of newspaper designing and print production.
- To inculcate the concepts of multimedia for online and offline publishing.
- To impart knowledge of modern software for graphic communication and digital production/marketing.

Course Outcomes: -

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

Unit -1

Introduction to 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- various sources 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 chat and 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- Melwin Mecher
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 Mansaf Alam
13. Introduction to multimedia by Ana Weston Solomon

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	1	1	-	1	-	-	-	1	3	3	2	2	
CO2	3	2	1	-	-	-	-	-	-	-	2	3	3	2	1	
CO3	3	2	2	1	1	-	1	-	-	-	3	3	3	3	1	
CO4	3	3	1	-	-	-	-	-	-	-	2	3	3	2	2	
CO5	3	3	3	-	1	-	1	-	-	-	2	2	3	3	1	

SUBSTRATES FOR PRINTING

General Course Information	
<p>Semester-VI</p> <p>Course Code: PEC –PTG152-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart technical knowledge of various cellulosic and non-cellulosic substrates used in the field of printing & packaging.
- To inculcate the concepts of substrate properties and testing.
- To conceptualize the areas of various printing substrates to be used for various printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define various printing substrates used in printing industry.	L1
CO 2	explain applications of various substrates.	L2
CO 3	generalize various tests to enhance the print quality.	L3
CO 4	compare the different types of substrate available.	H1
CO 5	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.

Text and Reference Books:

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	2	2	1	1	2	-	1	-	-	-	1	3	3	1	2
CO2	3	2	1	2	-	-	2	-	-	-	2	3	3	2	1
CO3	3	2	2	1	1	1	1	-	-	-	3	3	3	3	1
CO4	3	3	1	-	-	1	2	-	-	-	2	3	3	2	2
CO5	3	3	3	-	1	1	1	-	-	-	2	2	3	3	1

PRINTING ORGANIZATIONS AND PLANT LAYOUT

General Course Information	
<p>Semester-VI</p> <p>Course Code: PEC-PTG153-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorial</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To understand the area of plant layout to be used for Printing & Packaging machinery set-up.
- To inculcate the concepts of factory building management and control.
- To build-up an analytical approach to improve the plant efficiency by improving plant layout and design.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define the print organization and management	L1
CO 2	describe the procedure of site selection	L2
CO 3	interpret the various tools and techniques of Plant Layout	L3
CO 4	examine most inclusive areas where Factory Building and Analytical approach of plant layout used in printing technology	H1
CO 5	identify the Plant layout challenges in printing industry	H2

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 location, location strategy-factors influencing choice of location. State regulations on location. Backward areas and Industrial policy. Govt. Policies for decentralization, Industrial estates, comparison 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. Retraction 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 multistorey 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, 1st 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:**

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

INTRODUCTION TO PACKAGING

General Course Information	
<p>Semester-VI</p> <p>Course Code: PEC –PTG154-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>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.</p> <p>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.</p>

Course Objectives: -

- To impart technical knowledge of various forms of packaging.
- To inculcate the concepts of package design and product-package interaction.
- To conceptualize the new areas of packaging.

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	H1
CO 5	To understand principles of metal and wooden packaging	H2

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. Markings on package - 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 to Papers 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. **Glass Packaging:** Glass Packaging Forms, requirements of Glass Container, Coating in Glass Containers, Closures for Glass Containers, **Wooden Packaging:** 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:

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

PRINTED ELECTRONICS

General Course Information	
<p>Semester-VI</p> <p>Course Code: PEC-PTG155-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart technical knowledge of various products to be formed by the applications of printed electronics.
- To explore the applications of various printing processes in the areas of printed electronics.
- To conceptualize the ink and substrate requirements for printed electronics.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Describe the various applications and areas of importance related to printed electronics.	L1
CO 2	Explain the various printing processes being used for printing of printed electronics products.	L2
CO 3	Generalize different substrates used for printed electronics.	L3
CO 4	Point out the printed electronics inks.	H1
CO 5	Justify 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	-	-	-	-	-	-	-	1	3	3	3	2
CO2	3	2	1	-	-	-	-	-	-	-	2	3	3	3	2
CO3	3	2	2	-	-	-	-	-	-	-	3	3	3	3	3
CO4	3	3	1	-	-	-	-	-	-	-	2	3	3	3	2
CO5	3	3	3	-	-	-	-	-	-	-	2	2	3	2	3

PAPER TECHNOLOGY

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG302-T Course Credit: 4 Contact Hours: 3/week, (L-T-P:3-1-0)</p> <p>Mode: Lectures and Tutorials Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart technical knowledge of various fibrous and non-fibrous materials used in paper manufacturing.
- To explore knowledge about areas of virgin and recycled paper manufacturing.
- To impart knowledge of paper suitability for different printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various sources of fibrous and non-fibrous materials used in papermaking	L1
CO 2	Explain paper making process	L2
CO 3	Examine various finishing operations used in papermaking	L3
CO 4	Compare various properties of paper	H1
CO 5	Determine 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. **Prakash Sethi**, Printing Materials, MJP Publishers, Kindle Edition, 2014
2. **H. Kippan**, Handbook of Print Media, Springer, 1st Edition, 200
3. **Bob Tompson**, Printing Materials, Leatherhead : Pira International, 2nd Edition, 2004
4. **Jain and Jain**, Engineering Chemistry, Dhanpat Rai Publishing Company; 16th Edition (1 January 2015)
5. **NIIR Board**, Complete Technology book on Printing Inks, Delhi : Asian Pacific Business Press, 1st Edition, 2006
6. **Herbert Holik**, Hand Book of Paper and Board, Wiley-VCH, 2006

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	1	1	-	1	-	-	-	1	3	3	3	2
CO2	3	2	1	1	-	-	-	-	-	-	2	3	3	3	2
CO3	3	2	2	-	1	-	-	-	-	-	1	3	3	3	3
CO4	3	3	1	1	-	-	2	-	-	-	1	3	3	3	2
CO5	3	3	2	-	1	-	-	-	-	-	1	2	3	2	3

PAPER TECHNOLOGY LAB

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG302-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart technical knowledge of paper properties and testing.
- To impart practical knowledge of paper suitability for different printing processes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various sources of fibrous and non-fibrous materials used in papermaking	L1
CO 2	Explain the paper making process	L2
CO 3	Examine various finishing operations used in papermaking	L3
CO 4	Compare various properties of paper	H1
CO 5	Determine suitability of paper for various printing requirements	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	1	1	-	1	-	-	-	1	3	3	3	2
CO2	3	2	1	1	-	-	-	-	-	-	2	3	3	3	2
CO3	3	2	2	-	1	-	-	-	-	-	1	3	3	3	3
CO4	3	3	1	1	-	-	2	-	-	-	1	3	3	3	2
CO5	3	3	2	-	1	-	-	-	-	-	1	2	3	2	3

PRINT FINISHING

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG304-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart technical knowledge of various print finishing tools and equipments.
- To explore knowledge about various binding operations used for book binding.
- To impart basic knowledge of various book binding materials.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to	RBT Level
CO 1	describe various binding materials used in printing	L1
CO 2	explain various print finishing and binding operations	L2
CO 3	use appropriate binding style for appropriate job	L3
CO 4	differentiate numerous print finishing operations	H1
CO 5	justify the 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 gilding, 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	2	1	2	-	1	-	-	-	-	-	1	2	1	2	--
CO2	2	2	1	-	1	-	-	-	-	-	1	3	1	2	--
CO3	2	1	2	-	-	-	-	-	-	-	2	2	2	2	--
CO4	2	2	1	-	-	-	-	-	-	-	3	2	2	2	--
CO5	2	2	2	-	1	-	-	-	-	-	1	1	2	2	--

PRINT FINISHING LAB

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG304-P</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart practical knowledge of various print finishing tools and equipments.
- To provide hands-on experience of binding operations used for book binding.
- To impart practical knowledge of various book binding materials.

Course Outcomes: -

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

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

Printing Ink Technology

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG306-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart basic knowledge of various types of printing inks used for different printing processes and identifying new areas of ink requirements especially for security printing applications.
- To provide technical knowledge of ink manufacturing process and ink testing methods.
- To impart practical knowledge on various ink drying mechanisms/curing.

Course Outcomes: -

Sr. No.	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	Compare the different printing inks	H1
CO 5	Appraise various curing methods of ink drying	H2

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 oxidants, 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 printing 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:

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

PRINTING INK TECHNOLOGY LAB

General Course Information	
<p>Semester-VI</p> <p>Course Code: PCC-PTG306-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart practical knowledge of various types of printing inks used for various printing processes.
- To provide hands-on experience of ink testing.
- To impart practical knowledge of various chemicals used in printing.

Course Outcomes: -

Sr. No.	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	Distinguish different Drying Mechanisms and their importance in printing and packaging	L2
CO 3	Classify different properties of Printing Inks	L3
CO 4	Examine the different printing inks	H1
CO 5	Point out the radiation curing methods of ink drying	H2

List of Experiments:

1. Various samples of Paper and their study.
2. Different samples of Inks and their study.
3. Light fastness 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:

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

Scheme & Syllabus

for

B. Tech.

(Printing Technology)

4th Year (7th Semester)

B. Tech. (Printing Technology) VII- Semester, w.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Open Elective Courses	OEC-III	--	Open Elective Course-III	3	0	0	3.0	--	3.0	30	70	100	
2.	Program Elective Courses	PEC-II	--	Program Elective Course -II	3	0	0	3.0	--	3.0	30	70	100	
3	Program Elective Courses	PEC-III	--	Program Elective Course-III	3	0	0	3.0	--	3.0	30	70	100	
4.	Professional Core Courses	PCC-PTG401-T	PCC-PTG401-P	Quality Control in Printing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
5.	Project Work	--	PROJ-PTG401-P	Project-I	0	0	4	--	2.0	2.0	30	70	100	
6.	Project Work	--	PROJ-PTG403-P	Printing Industry Awareness Project	0	0	4	--	2.0	2.0	30	70	100	
7.	Project Work	--	PROJ-PTG405-P	Industrial Training Presentation-II	0	0	2	--	1.0	1.0	30	70	100	
8.	Mandatory Courses	--	MC-PTG401-P	General Proficiency	0	0	2	--	0.0	0.0	30	70	100 (Qualifying Only)	
					12	0	15							
Total Credits										18.5	Total Marks:- 800			

Program Elective Course-II		Program Elective Course-III	
Course Code	Course Name	Course Code	Course Name
PEC-PTG251-T	Book Publishing	PEC-PTG351-T	Security Printing
PEC- PTG252-T	Print Entrepreneurship	PEC- PTG352-T	E-Publishing
PEC- PTG253-T	Management for Printing Organizations	PEC- PTG353-T	Print Wastage Management
PEC- PTG254-T	Computer Graphics in Printing	PEC- PTG354-T	Advancements in Printing
Any one MOOC course not studied earlier (or to be studied as per scheme)			

OEC-III (OPEN ELECTIVE COURSE- III)

Student will select one subject from the list of course available in OEC-III list. Subject will be offered by respective department (other than Department of Printing Technology).

General Course Information	
Course Code: OEC-III	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Credit: 3.0	Syllabus and general instructions will be provided by respective department. Final course code will be as per subject code of respective department.
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

PEC-II (PROGRAM ELECTIVE COURSE- II)

Student will select one subject from the list of course available in PEC-II list PEC-PTG251-T/ PEC-PTG252-T/ PEC-PTG253-T/ PEC-PTG254-T. Subject will be offered from the department of printing technology. Detailed syllabus is attached here with. As per the letter vide No. COE/2019 189-212 dated 30.08.2019, to offer any program elective course 30% of class strength is mandatory in UG programs.

BOOK PUBLISHING

General Course Information	
<p>Semester-VII</p> <p>Course Code: PEC-PTG251-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To impart knowledge about pre-production planning, planning of book production.
- To give knowledge about elements and intricacies of different types of book production.
- To impart knowledge about technical, commercial and legal aspects of book production.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Understand the aspects of Book Publishing.	L1
CO 2	Analyze the author publisher relationship and editor's functions.	L2
CO 3	Generalize the book distribution and copyright agreements.	L3
CO 4	Differentiate the responsibilities and functions of publishing house.	H1
CO 5	Assess the digital publishing and legal aspects of book publishing	H2

UNIT-I

Introduction- Introduction to Book Publishing, Publishing Organization

Areas of Publishing – General publishing, Educational publishing, Professional publishing, Reference publishing, Publishing textbooks for children; Publishing House role – Commissioning editor, Desk Editor, Designer, Production Manager, Sales/Marketing manager, Publishing Manager, their role and responsibilities.

UNIT-II

Editorial Process and Development: Copy editing, Page makeup, Proofs; Role and Responsibilities of Book Editor – Multipurpose functions; Discussion with author, Editing educational material, Decision making role; Editorial technique – Style sheet, Reference aids; Author and his manuscript – Unsolicited manuscripts; Author – Publisher relationship, Professional guides and Societies, Literary agency. Software need, manuscript formats and file management, editing tools, web design and publishing; copy right, types of agreement between author and publishers, agreement of sale of translation rights, illustration and artwork agreement, the outright sale of the copyright, profit, Sharing agreement, the royalty system, commission agreement, New laws and regulations in this field.

UNIT-III

Production & Estimating In Book Publishing: Pre-production planning, manuscript, layout & design, imposition, composition, anatomy of books; Printing techniques; Production process; Technical aspects of production; Quality control –proofing stage; Finishing operations; Financial aspects; First copy cost, manufacturing cost, overheads; Economics of publishing – net book, non-net book, variation in price, published price of the book, Understanding input cost and variation in estimating and costing for books.

UNIT-IV

Promotion Channels, Distribution Outlets and Sales Techniques: Direct promotion techniques, mail order advertising, subscription books, direct mail promotion, library purchases, export and import of books, publishers and booksellers catalogues, publicity campaign, paperback distribution, the central book clearing house, economics of distribution, the role of booksellers, book marketing council, book development council.

Text & Reference Books:

D Richard Guthrie, Publishing Principle and Practice, Fifth Edition, 2011 Pete Masterson, Book Design and Production, Aeonix Publishing, Second Edition, 2007

1. Giles Clark and Angus Phillips, Inside Book Publishing, Routledge, Fifth Edition, 2014
2. G.S.Jolly, Book Publishing Management, Har-Anand Publication, First Edition, 2009
3. Frania Hall, The business of Digital Publishing, Routledge, Fifth Edition, 2013
4. Lynette Owen, Clark's Publishing Agreements: A Book of Precedents, Bloombury Publications, Ninth Edition, 2013
5. Adrain Bullock, Book Production, Routledge, First Edition, 2012

Course Articulation Matrix:

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

PRINT ENTREPRENEURSHIP

General Course Information	
<p>Semester-VII</p> <p>Course Code: : PEC-PTG252-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give comprehensive knowledge of advantages, limitations and challenges for entrepreneurship.
- To impart knowledge about various schemes and sources of finance for entrepreneurs.
- To impart knowledge about business planning and forms of ownership to run a new generation successful business.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various qualities and pre-requisites of entrepreneurs.	L1
CO 2	Explain various quick start methods.	L2
CO 3	Examine business planning process.	L3
CO 4	Point out various forms of ownership in business.	H1
CO 5	Justify significance of entrepreneurship in Printing Industry	H2

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, New generation entrepreneurship, essentials of print entrepreneurship for printing, publishing, packaging and customized printing.

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, Introduction of various funding agencies, Essentials for starting of print entrepreneurship for flexible and rigid package.

Unit-III

Business Planning Process: Requirement of good business Plan, Business Plan-the major benefits, sub plan, Business plan-blue print to success and financing, small manufactures business plan, Feasibility Report, Project Reports, Business succession plan, planning for establishing printing and packaging organizations. Case studies of 5 successful print/packaging entrepreneurs.

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 program, Role of Govt. and promotional agencies in entrepreneurship development, Agencies (Govt. and Non-Govt.)for funding of printing and packaging establishments.

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.**

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

MANAGEMENT FOR PRINTING ORGANIZATIONS

General Course Information	
<p>Semester-VII</p> <p>Course Code: : PEC-PTG253-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To impart knowledge about various functions of management for different types of printing organizations.
- To impart knowledge about different types of organizations, their roles, advantages, limitations and their managerial requirements.
- To understand the role of Information Technology based services for managing small to large scale printing organizations.

Course Outcome:-

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the concept of Management.	L1
CO 2	Compare different types of organization.	L2
CO 3	Generalize the knowledge about various types of management required in printing organization.	L3
CO 4	Identify the application of advanced tools for managing printing organizations.	H1
CO 5	Appraise appropriate technique of achieving Quality and standard.	H2

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 for rigid, flexible and publication printing.

Unit- 2

Type of Companies - Private and Public Limited – Characteristics of Private and Public Limited Companies, Meaning of Stock Register - Maintenance of Stock Registers and Advantages of Stock Registers.

Accounting and Budgeting: Accounting principles – Meaning of accounting principles, Classification or sub-fields of accounting – Financial accounting, Cost accounting, Management accounting and Tax accounting. Cost Accounting: Cost concept, cost sheet, B.E.P.analysis, cost reduction and cost control, advice/discussion of types of companies for Printng & Packaging Industry.

Unit- 3

Human Resource Management (HRM): Employee Recruitment, Training and Retention – Human Resource Management, Meaning of Recruitment, Objective of the Recruitment Process, Training and Development, Out sourcing, Employee Retention. Employee Motivation and Welfare, Employee Benefits, Work Study and Method Study – Time Management and Productivity Tools.

Marketing: Market research for new printing and packaging applications, Marketing and its functions, distribution channels, salesmanship and advertising with special reference to printing and packaging industry and for customized printing.

Unit- 4

Production and Operations Management: Locations and Layout of plant, Maintenance management. Quality assurance, Total quality management (TQM), ISO.

Business Environment: printing industry in India and Abroad, Impact of globalization and information technology (IT) in the field of graphic arts industry. Work flow and organizational structure in a printing press/packaging organization/print purchase/print consumable buying

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. Production and Operations Management - Mchelmann Oakland, Lockyer
5. Nick Van Dam, Jos Marcus- Organization and Management –An international Approach
6. Mendiratta B.D. – Estimating & Costing by Print Trade Publications,
7. Prof. Dr. Helmut Kipphan (Ed.) – Handbook of Print Media, published by Springer

Course Articulation Matrix:

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

COMPUTER GRAPHICS IN PRINTING

General Course Information	
<p>Semester-VII</p> <p>Course Code: PEC-PTG254-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives:-

- To impart knowledge of various display devices used in pre-press.
- To give comprehensive knowledge of various file formats used in graphic arts industry and their applications.
- To impart knowledge of interactive and passive computer graphics used in the field of printing technology.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define types of Computer Graphics in printing and packaging arena	L1
CO 2	describe the Pre-press sections of industrial sectors for in-depth assignments	L2
CO 3	classify and execute interactive devices.	L3
CO 4	examine most inclusive areas where publishing software and file formats used in printing industry.	H1
CO 5	justify computer graphics skills and knowledge in the printing Organization.	H2

UNIT– I

Overview of Computer Graphics- Interactive graphics, Passive graphics. Advantages of interactive graphics. Introduction to 2-D and 3-D Graphics. Display Devices: Refresh CRT, Random-Scan and Raster-Scan Monitor, Color CRT Monitors, DVST, Plasma-Panel Displays, LED and LCD monitors. Hard copy devices.

UNIT– II

Language and File Formats:- Document Processing Language, Programming for processing in Post Script Language, Detail study about vector graphics and Bit Map images, life size and image compression, linking objects to URL's for internet web pages, Portable document format, print document format, PDF workflow systems, print job ticket format (PJTF), Raster image processing, linking, electronic dot generator. Publishing software: PageMaker, CorelDraw etc.

UNIT– III

Graphic Text Formats- GIF – Graphic Image Format, TIFF – Tagged information file format, JPEG- Joint Photographer Experts Group, BMP – Bitmaps, EPS – Encapsulated Postscript Format, PICT – picture, RTF – Rich Text Format, DOC – Document format, WPG – Word Perfect Graphic, Txt – Text formats, Publishing software: MS Word. OPI servers file server & networks, digital file export.

UNIT– IV

Interactive Graphics- Concept of Positioning and Pointing. Interactive Graphic Devices (Key Boards, Touch Panels, Light Pens, Graphic Tablets, Joysticks, Mouse-Voice System) Interactive Graphical Techniques: Basic Positioning Methods, Constraints, Grids, Gravity field, Rubber-Band Methods, Sketching, Dragging, Inking and Painting. Computer Graphic Software: Introduction, GKS (Primitive, attributes and Viewport, Display subroutines)

Text & Reference Books:

1. Roy, A. Plastock, Gordon Kalley, "Computer Graphics" (Scham's Series) McGraw Hill.
2. Donald Hearn, M. Pauline Baker, "Computer Graphics", Prentice Hall of India.
3. Foley, VanDam, Fiener, Hughes, "Computer Graphics", Addison Wesley.
4. Harrington, Steven, "Computer Graphics A Programming Approach", McGraw Hill.
5. Dovid F. Rogers; "Procedural Elements for Computer Graphics", McGraw Hill.
6. Newman, W. Sproul, R.F., "Principles of Interactive Computer Graphics", McGraw Hill.
7. PDF : Printing & Workflow, Frank J. Romano, GATF Publication
8. Adobe Guide on Post Script Language.

Course Articulation Matrix:

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

PEC-III (PROGRAM ELECTIVE COURSE-III)

Student will select one subject from the list of course available in PEC-III list PEC-PTG351-T/ PEC-PTG352-T/ PEC-PTG353-T/ PEC-PTG354-T. Subject will be offered from the department of printing technology. Detailed syllabus is attached here with. As per the letter vide No. COE/2019 189-212 dated 30.08.2019, to offer any program elective course 30% of class strength is mandatory in UG programs.

SECURITY PRINTING

General Course Information	
<p>Semester-VII</p> <p>Course Code: PEC-PTG351-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of various features of security documents i.e. Currency, negotiable instruments for banks, education certificates etc..
- To give knowledge of security features for packaging applications and brand protection.
- To impart knowledge for the successful implementation of security features for new generation printing and packaging applications

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define types of security printing products and processes	L1
CO 2	describe currency printing process with security features of currency	L2
CO 3	apply and execute security features in bank and office documents	L3
CO 4	differentiate various security features of educational documents and new generation security products	H1
CO 5	compare security features for various printing and packaging applications	H2

UNIT-I

Security Printing: - Introduction to Security Printing, Introduction to - Currency Printing, Educational Certificates, Postal, Judicial and Non-judicial Stamps, Identity cards, Adhar Card & PAN Card.

Security Printing Processes: - Introduction of security features by Sheet- fed Gravure, Sheet-fed offset, Web-fed gravure, Web-fed offset, Dry offset, Letterpress, Digital printing.

UNIT-II

Currency Printing :- Introduction to Currency Printing, List of Security Printing & their identification in Currency Printing - Secret Patterns, Watermarks, Fine line Printing, Micro Printing, Identification standards, Secret Patterns, etc.

Educational Certificates & Negotiable Instruments Printing: - Cheque Printing, Draft Printing, Cheque numbering, coded information, MICR system-magnetic ink character recognition, CBS requirements, Instruments for identification of security features. Security features for Degree, DMC and other secured documents of Universities and educational institutes.

UNIT-III

Introduction to Credit & Charge Card Printing:- Credit card, Debit Card, Plastic Card for payment, Magnetically enclosed stripping, embossed information and holograms, caliper and dimensions, Protection, Signature panels, Identity Cards.

Modern Security Techniques: - RFID, Bar-Coding, QR Codes, Holography, Foils, High-resolution borders. Composite Pictures, Watermark, Security threads.

UNIT-IV

Introduction of Security Inks and Substrates:- Features, Application, Advantage & Limitations of Metallic Inks, Florescent Inks, OVI Inks.

Introduction of Security Printing Substrates:-Features, Application, Advantage & Limitations of Conventional & Non-conventional substrates (Non tear able paper, Plastic) for Security Printing.

Text & Reference Books:

1. Printing Guide to Systems and their uses by W.R. Durrant.
2. MICR by Kant Dabholkar

Course Articulation Matrix:

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

E-PUBLISHING

General Course Information	
Semester-VII Course Code: PEC-PTG352-T Course Credit: 3 Contact Hours: 3/week, (L-T-P: 3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give knowledge of elements of e-publishing for different applications.
- To impart knowledge of various features of e-publishing for Book and Newspaper publications.
- To impart knowledge about concepts, networks and file formats for e-publishing.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	list definition, advantage and limitations of e-publishing	L1
CO 2	describe various methods of creating e-books.	L2
CO 3	demonstrate principles PDF formation and distribution.	L3
CO 4	examine various concepts of networks used for e-publishing	H1
CO 5	evaluate steps involved in producing e-books	H2

Unit-I

Introduction: - E-Publishing, Introduction, Types, Key Aspects, Advantages, Limitations, Principles of creating e-book, Editing Cover page, E-book design, ISBN registration, Copy right certification, Marketing, E-book format, E-book reader.

Unit-II

Software and File formats:- Introduction about PDF, PDF production using Adobe In-design, Steps involved in PDF production using Quark Xpress. Steps involved in PDF production using Adobe distiller, Copy- editing using symbols and marks, Proof reading symbols and meaning

Unit-III

E-Publishing Essentials- Introduction about Web to print, Network concepts and Interfaces, Classification of Network, Production Management/Monitoring Systems, Commissioning and Peer Review, Editing and Proofreading, Design and Typesetting, Printing, Sales and Marketing, Warehousing and Distribution

Unit-IV

Special Applications- Kinds of E-publishing Products, Electronic Books, Electronic Journals, E-zine, Electronic Theses and Dissertations, Electronic Reference Source, Other types of E-documents, Pricing of E-documents, Current Issues in E-Publishing, Future of E-Publishing.

Recommended Books:

1. <http://egyankosh.ac.in>, E Publishing, IGNOU Study Material, Unit-10
2. Electronic Publishing, AGPC, Sivakashi Study Resources

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

PRINT WASTAGE MANAGEMENT

General Course Information	
<p>Semester-VII</p> <p>Course Code: PEC-PTG353-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give knowledge of various sources of wastes being produced in print production.
- To impart knowledge of types of wastes and tools for reduction of waste.
- To impart knowledge about new generation techniques for managing wastes.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	list Environment, ecology, biotic and biotic components and sustainable development concept.	L1
CO 2	distinguish Packaging wastes- Solid, liquid, gaseous, Ink management, noise management, efficiency improvement, effluent treatment and waste minimization	L2
CO 3	solve the RRR concept with printing and packaging	L3
CO 4	identify degradable and non-degradable printing and packaging materials.	H1
CO 5	justify ISO 14000 series, Waste management plan, Waste audit	H2

Unit-I

Introduction: Environment, ecology, biotic and biotic components and sustainable development concept. Operations used in printing and packaging industry, Environmental impacts of printing and packaging operations, Laws and regulations impacting waste disposal in printing and packaging industries in India and abroad.

Unit-II

Packaging wastes- Solid, liquid, gaseous, Ink management, noise management, efficiency improvement, effluent treatment and waste minimization. To study 5R concept related with printing and packaging, Managing wastes of various categories as per government rules/regulations.

Unit-III

Eco-friendly aspects in pre-press, press and post-press, carbon footprints, study degradable and non-degradable printing and packaging materials. Environmental impact including risk assessment, and impact on businesses

Unit-IV

Deming Cycle, ISO 14000 series, Waste management plan, Waste audit, Health and Safety. Energy conservation mechanisms with printing and packaging, Case studies of various printing organizations for waste management exclusively for printing, packaging and allied industries

Text & Reference Books:

1. Waste management practices by John Pichtel
2. Plastic free by Beth Terry

Web links:<http://aep.alberta.ca/waste/pollution-and-prevention/for-businesses/documents/WasteMinimization-PrintingPublishing.pdf>

Course Articulation Matrix:

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

ADVANCEMENTS IN PRINTING

General Course Information	
<p>Semester-VII</p> <p>Course Code: PEC-PTG354-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give knowledge of recent advancements in printing and packaging industry.
- To impart knowledge of advanced printing processes and techniques used in printing industry.
- To impart knowledge about advanced methods and operations used in printing industry.

Course Outcome:-

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define advancement development in printing.	L1
CO 2	classify various advanced operations and process operations.	L2
CO 3	demonstrate various advanced techniques for production.	L3
CO 4	compare various advanced techniques used in printing	H1
CO 5	determine appropriate advanced techniques for production.	H2

Unit 1

Inkjet printing: Introduction, working principle, advantages and disadvantages. Application; 3D printing: overview, working process, materials, 4D Printing

Digital Printing: Introduction, Process, advantages and disadvantages, various types of digital printing processes; **Hybrid Printing:** with conventional, NIP technologies

Unit 2

Security Printing: Various feature of advanced security printing,

Imaging Technologies: Computer to Plate, Computer to Press: Direct Imaging and computer to print, Computer to Cylinder, Computer to Screen, Square spot dot Technology

Unit 3

Colour Management: Concept, Colour calibration, Colour management software (CMS), colour matching techniques, colour models, ICC profiles, Colour management workflow, ISO standard, equipments used for colour management

Software Involvement: Advanced DTP softwares, introduction and applications, RIP software, CIP3, CIP4, G7 Specifications

Unit 4

Internet of Things (IoT): concept, applications, scope of IoT in printing, sustainability

Miscellaneous: Green Printing, Erasable Printing Technology, Online printing Platforms, Augmented reality (AR), Concept of Yellow Bar, Printed Electronics, DI presses, Lenticular Printing, Customized printing, Hybrid Printing

References:

1. Prof. Dr. Helmut Kippan, Handbook of Print Media, published by Springer
2. Michael Kriss, Handbook of Digital Imaging, published by Wiley, 2015
3. Ian M Hutchings, Graham D. Martin, Inkjet technology for digital fabrication, published by Wiley, 2012
4. Phil Green, Color Management Understanding and using ICC profiles published by Wiley, 2010

Course Articulation Matrix:

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

QUALITY CONTROL IN PRINTING

General Course Information	
<p>Semester-VII</p> <p>Course Code: PCC-PTG401-T</p> <p>Course Credit: 3</p> <p>Contact Hours: 3/week, (L-T-P: 3-0-0)</p> <p>Mode: Lecture</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give comprehensive knowledge of concepts of quality control and its importance in printing industry.
- To impart knowledge of ISO, BIS and other standards used in printing industry.
- To provide knowledge about inspection and testing of raw materials and printed products.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various definitions of quality, control, quality control and quality assurance.	L1
CO 2	Explain various quality terminologies used in print industries.	L2
CO 3	Examine principles of ISO and other printing standards.	L3
CO 4	Identify various quality control attributes being used for checking print quality.	H1
CO 5	Determine print quality with the help of related instruments.	H2

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 series. Paper and paper board testing instruments for testing printability, print quality and end-user requirements, Introduction to G7 specifications and its applications. Introduction and applications of National & International Printing Standards (IS & ISO standards).

Unit-IV

Ink testing instruments 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, Print testing instruments, Standards and their tolerance.

Recommended Books:

1. W.H. Banks, Inks, Plates and Print Quality, Pergamon Press
2. Quality Control for quality printing, Graphic Arts, Technical Foundations.

Course Articulation Matrix:

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

QUALITY CONTROL IN PRINTING LAB

General Course Information	
<p>Semester-VII</p> <p>Course Code: PCC-PTG401-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To give practical knowledge of various raw materials and print testing equipments.
- To impart knowledge of ISO, BIS and other standards used in printing industry.
- To provide knowledge about inspection and testing of materials used in printing.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	List various definitions of quality, control, quality control and quality assurance.	L1
CO 2	Explain various quality terminologies used in print industries.	L2
CO 3	Examine principles of ISO and other printing standards.	L3
CO 4	Identify various quality control attributes being used for checking print quality.	H1
CO 5	Determine print quality with the help of related instruments.	H2

List of Experiments –

1. Introduction to colour management software
2. Introduction to spectro-densitometer
3. Introduction to iLiO
4. Introduction to G7 specifications and their importance
5. Introduction to ISO specifications
6. Paper, ink and package testing
7. Tests on poly substrates
8. Hot air oven tester
9. Pick strength testing
10. Measurement of viscosity of ink, tack measurement for ink

Course Articulation Matrix:

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

PROJECT-I

General Course Information	
Semester-VII	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Code: PROJ-PTG401-P	Internal practical evaluation is to be done by respective project guide. The end semester practical examination will be conducted jointly by external and internal examiners.
Course Credit: 2.0	
Contact Hours: (L-T-P: 0-0-4)	
Mode: Lecture	
Examination Duration: 3 Hours	

Course Objectives: -

- To inculcate manufacturing and fabrication skills for small printing machines/equipments used in printing industry.
- To enhance technical, financial, interpersonal and communication skills among students.
- To convert ideas and technical knowledge into practical applications.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	recognize the importance of major techniques and processes used in printing industry.	L1
CO 2	interpret technical knowledge into practical applications	L2
CO 3	generalize the art of planning, conceptualization and implementation of ideas to objects/techniques/learning resources.	L3
CO 4	arrange different printing products from different verticals of printing	H1
CO 5	justify technical, financial, interpersonal and communication skills among students.	H2

Guidelines: - The concept of project work will be started by a group of one third of class strength under the guidance of project guide (faculty member). The purpose of Project-I is to inculcate manufacturing and fabrication skills for small printing machines/equipment which

is required to be submitted in 8th Semester for Project-II. It is mandatory to submit at least one printed product/one learning resource to respective project guide and demonstration of the same in front of external examiner for evaluation of project-I.

It is mandatory requirement to submit the following for Project-I:-

1. Printed product (at least one)/Learning Resource (at least one)
2. Synopsis for Machine/Equipment duly Signed by Project Guide to be submitted for Project-II (8th Semester).

Course Articulation Matrix:

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

PRINTING INDUSTRY AWARENESS PROJECT

General Course Information	
Semester-VII	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Code: PROJ-PTG403-P	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) and internal examiner.
Course Credit: - 2.0	
Contact Hours: 2/week, (L-T-P:0-0-4)	
Mode: Practical/Hands on Experience	
Examination Duration: 3 Hours	

Course Objectives: -

- To evaluate the industrial training report of students gone for industrial training after 6th Semester.
- To inculcate presentation skills (Verbal and Non-verbal) among the students.
- Enhance technical and communication skills of the students regarding recent developments in Printing and Packaging Industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Recognize the importance of major techniques and processes used in printing industry.	L1
CO 2	Demonstrate various domains of printing and packaging technology.	L2
CO 3	Classify difference between various types of printing and packaging industries; small, medium and large scale	L3
CO 4	Identify hands-on practical knowledge in the areas of printing and packaging	H1
CO 5	Appraise technical, financial, interpersonal and communication skills among students.	H2

Guidelines:- 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 6 weeks during the earlier semester vacations. During the 6 weeks training, it is mandatory to visit 3 printing organizations (2 from State and 1 from outside State at least apart from regular training) and prepare a detailed report about visit and working of the organizations. 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. During the industrial training, industry mentor is requested to assign a live project to every student. A detailed report on problem, background, possible solutions, outcomes and learning should be submitted by the student through industry mentor to training and placement coordinator of the department. For Printing Industry Awareness Project following is the mandatory requirement:-

- Printing industry visit report to 3 printing organizations (2 from the state and 1 from outside State at least apart from regular training during the 7th semester).

Course Articulation Matrix:

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

INDUSTRIAL TRAINING PRESENTATION-II

General Course Information	
Semester-VII	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Code: PROJ-PTG405-P	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) and internal examiner.
Course Credit: - 1.0	
Contact Hours: 2/week, (L-T-P:0-0-2)	
Mode: Practical/Hands on Experience	
Examination Duration: 3 Hours	

Course Objectives: -

- To evaluate the industrial training report of students gone for industrial training after 6th Semester.
- To inculcate presentation skills (Verbal and Non-verbal) among the students.
- Enhance technical and communication skills of the students regarding recent developments in Printing and Packaging Industry.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	outline the importance of technical terms used in printing industry.	L1
CO 2	represent the technical terms with relevance.	L2
CO 3	use the art of preparation of technical presentations	L3
CO 4	identify the art to deliver technical presentations	H1
CO 5	determine the technical and communication skills among students.	H2

Guidelines: - 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 6 weeks during the earlier semester vacations. Their performance will be periodically assessed by the faculty mentor 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 printing/packaging/print buying/ print selling/technical sales of printing consumables, ink and paper/service and maintenance/customer support.

For Industrial Training Project-II, following is the mandatory requirement:-

- Printing industry training report duly signed by industry mentor & faculty mentor.
- 6 Weeks regular training certificate from competent authority belong to industry.

Course Articulation Matrix:

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

GENERAL PROFICIENCY

General Course Information	
Semester-VII	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Code: MC-PTG401-P	For the end semester examination, the evaluation will be done by respective course coordinator and external examiner appointed by competent authority.
Course Credit: - 0.0, Non-Credit	
Contact Hours: 2/week, (L-T-P:0-0-2)	
Mode: Practical/Hands on Experience	
Examination Duration: 3 Hours	

Course Objectives:-

- To inculcate the extra-curricular skills among the students.
- To improve problem solving skills of the students.
- To impart basic understanding to improve general proficiency among the students.

Course Outcomes:-

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO1	state the importance of extra-curricular activities along with academics.	L1
CO2	express the role of social activities in career/professional development of an individual.	L2
CO3	use most feasible solution to tackle the problem in a team.	L3
CO4	compare the on-going topic in a group discussion.	H1
CO5	justify the most preferred solution for a project work.	H2

	_____	_____
	_____	_____
Music	_____	_____
	_____	_____
	_____	_____
Fine Arts	_____	_____
	_____	_____
	_____	_____
Painting	_____	_____
	_____	_____
	_____	_____
Hobby Club	_____	_____
	_____	_____
	_____	_____
N.S.S.	_____	_____
	_____	_____
	_____	_____
Hostel	_____	_____
	_____	_____
Management Activities	_____	_____
	_____	_____
Any other Activity (please Specify)	_____	_____
	_____	_____

III. Education Tours/Visits/Membership of Professional Societies (5 Marks)

1. _____
2. _____
3. _____
4. _____

IV. Contribution in NSS Social Welfare Floor Relief/Draught relief/ Audit Literacy mission/Literacy Mission/Blood Donation/ Any other Social Service (5 Marks)

1. _____
2. _____
3. _____
4. _____
5. _____

V. Briefly evaluate your academic & other performance & achievements in the Institution (5 Marks)

VI. Performance in Viva voce before the committee (10 Marks)

*Marks obtained I. ()+II()+III()+IV()+V()+VI() =

**Total Marks:

Course Articulation Matrix:

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

Scheme & Syllabus

for

B. Tech.

(Printing Technology)

4th Year (8th Semester)

B. Tech. (Printing Technology) VIII- Semester, w.e.f. Batch 2021-25

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Program Elective Courses	PEC-IV	--	Program Elective Course -IV	3	0	0	3.0	--	3.0	30	70	100	
2.	Program Elective Courses	PEC-V	PEC-V (Lab)	Program Elective Course-V	3	0	2	3.0	1.0	4.0	T	30	70	100
											P	50	50	100
3.	Professional Core Courses	PCC-PTG402-T	--	Costing & Estimation in Printing	3	2	0	5.0	0	5.0	30	70	100	
4.	Professional Core Courses	PCC-PTG404-T	PCC-PTG404-P	Advanced Screen Printing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
5.	Project Work, Seminar and Internship in Industry	--	PROJ-PTG402-P	Project-II	0	0	8	--	4.0	4.0	30	70	100	
6.	Project Work, Seminar and Internship in Industry	--	PROJ-PTG404-P	Seminar	0	0	4	--	2.0	2.0	30	70	100	
					12	02	17							
Total Credits										22.5	Total Marks: - 800			

Program Elective Course -IV		Program Elective Course -V (Theory and Lab)			
Course Code	Course Name	Course Code	Course Name	Course Code	Course Name
PEC-PTG451-T	Speciality Printing	PEC-PTG551-T	Web Offset Printing	PEC-PTG551-P	Web Offset Printing Lab
PEC-PTG452-T	Green Printing	PEC-PTG552-T	Packaging Technology	PEC-PTG552-P	Packaging Technology Lab
PEC-PTG453-T	3D Printing	PEC-PTG553-T	Digital Printing	PEC-PTG553-P	Digital Printing Lab
PEC-PTG-454-T	Patents & IPR	PEC-PTG554-T	Colour Management	PEC-PTG554-P	Colour Management Lab
Any one MOOC course not studied earlier (or to be studied as per scheme)		Any one MOOC course not studied earlier (or to be studied as per scheme)			

Or
FULL SEMESTER INDUSTRIAL TRAINING

Sr. No.	Category	Course Code		Course Title	Hours per week			Course Credits			Evaluation Scheme			
		Theory	Practical		L	T	P	Theory	Practical	Total	Int.	Ext.	Total	
1.	Professional Core Courses	PCC-PTG402-T	--	Costing & Estimation in Printing	3	2	0	5.0	0	5.0	30	70	100	
2.	Professional Core Courses	PCC-PTG404-T	PCC-PTG404-P	Advanced Screen Printing	3	0	3	3.0	1.5	4.5	T	30	70	100
											P	50	50	100
3.	Industrial Training	--	PROJ-PTG442-P	Full Semester Industrial Training	0	0	26	--	13.0	13.0	As per Ordinance		500	
					06	02	29							
Total Credits										22.5	Total Marks:- 800			

Guidelines

The student will be required to submit to the department, the offer letter for the full semester industrial training, at-least 15 days before the commencement of 8th semester. The options shall be according to the following conditions: A student may opt for one semester industrial training in lieu of attending the courses of 8th semester. The scheme and syllabus for full semester industrial training is mentioned above.

A student will be allowed to join the industrial training under following conditions: -

- a. If the student gets selected for the job through campus placements and the employer is willing to take the student for the training for a period of full semester.
- b. If the student gets offer of pursuing training from reputed Research organization/Govt. sponsored project/ Govt. research institution/ Multinational corporations (MNCs)/ Public sectors.
- c. Student will have to manage their Professional Core Courses as per concerned faculty guidelines for conducting classes in offline/online mode.
- d. For completion of lab work, the student will have to undergo for two week capsule course in respective lab of the department prior to final practical examination.
- e. For evaluation of the industrial training, the guidelines circulated by T&P Cell will prevail.

For pursuing this training, the student shall require prior approval from Dean of Faculty of Engineering & Technology through the Chairperson of the respective department. To ensure the fruitfulness of this training, a list of companies, beside the Govt. organizations/ Public sectors, will be provided. The student will be allowed to go for training only to the companies/organizations mentioned in the list. The list can be modified (addition/deletion) from time to time subject to approval from Dean of Faculty of Engineering and Technology.

PEC-IV (PROGRAM ELECTIVE COURSE- IV)

Student will select one subject from the list of course available in PEC-IV list PEC-PTG451-T/ PEC-PTG452-T/ PEC-PTG453-T/ PEC-PTG454-T. Subject will be offered from the department of printing technology. Detailed syllabus is attached here with. As per the letter vide No. COE/2019 189-212 dated 30.08.2019, to offer any program elective course 30% of class strength is mandatory in UG programs.

SPECIALITY PRINTING

General Course Information	
Semester-VIII Course Code: PEC-PTG451-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P: 3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of various forms of specialty printing.
- To give knowledge of security features of printing substrates and inks.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to: -	RBT Level
CO 1	define concept of Specialty Printing	L1
CO 2	explain the specialty printing and its applications	L2
CO 3	compare specialty paper and ink materials	L3
CO 4	differentiate various techniques used in specialty printing	H1
CO 5	justify appropriate advanced technique of specialty operation in various fields of printing	H2

Unit 1

Specialty Printing: Introduction to specialty printing, Concept, Objective and Importance, Scope, specialty printing market, need of specialty printing, customer requirements, different between specialty printing and common printing

Specialty Printing Techniques: Introduction to Specialty printing techniques, applications, advantages and limitations of pearl printing, Hi-Fi Printing, Hybrid printing, Holography, Lenticular Printing, Effects in printing- Fresnel Lens effect, Holographic effect, Drip off effect

Unit -II

Specialty Paper: Introduction to Specialty papers, types of papers, constituents of special papers, uses, advantages and limitations

Specialty Ink: Introduction to Specialty Inks- specialty inks, metallic inks, ingredient of specialty inks, uses, advantages and limitations

Unit -III

Finishing Operations for Special Effects: Die cut Printing, Foil stamping, embossing, debossing, Perforations and folding, coating, varnishes, High gloss spot, uses, advantages and limitations.

Customized Printing for Specialized Uses: Wide format Printing, Customized Envelope Printing, Direct Thermal Label Printing, Scented Printing, Glow in the dark printing, customized envelope printing, Special effect printing, Velvet Effect, Sand Effect, Gloss Effect, Matte Effect.

Unit -IV

Security Printing: Security fibre, Security thread, watermarks, Planchettes and its types, Introduction to Currency printing, Negotiable Instrument Printing, Educational Document Printing, Confidentiality Printing, Postal Stamps, Judicial and Non-judicial Stamps, Warning Labels

Special Application Printing: Printed Electronics, QR, Variable data printing, AR, MICR etc.

Text Books & Study Materials: -

1. Prof Helmut Kippan, Handbook of Print Media, published by Springer
2. Ouyang Yun, Xu Min, Yang Li, Advanced Printing and Packaging Materials and Technologies, published by Trans Tech Publications
3. Mark J. Kirwan, Handbook of Paper and Paperboard Packaging Technology published by Wiley
4. Alexandra Pekarovicova and Paul D Fleming, Innovations in Ink and Paper Technology to improve printability, published by Pira International Ltd.

Course Articulation Matrix:

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

GREEN PRINTING

General Course Information	
Semester-VIII Course Code: PEC-PTG452-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To provide comprehensive knowledge of various concepts of green printing.
- To impart knowledge of environmental management system to be used to manage various forms of wastes being produced in Printing & Packaging organizations.
- To give knowledge of various forms of print wastes and waste management techniques.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	define the concept of green printing process and enable to tackle environmental problems in their chosen areas of application.	L1
CO 2	explain the concepts of recycling and various recycling techniques.	L2
CO 3	classify the Environment Management System, its aims and features.	L3
CO 4	Point out the use of bio-degradable and non-biodegradable materials, pollution reduction, use of alternate eco-friendly and biochemical based materials in printing.	H1
CO 5	Determine the Green Supply Chain Management and implications and develop knowledge about the recent trends, future implications and applications of Green Printing.	H2

UNIT-1

Green Printing Overview: Green Printing Overview, Biodegradable material, Necessity, Advantage, Printing wastes – characteristics, type, life cycle of waste, pre-press, press and post-press wastes, Material input and typical waste output in Printing Industry, List of chemical in Printing industry activities, Waste segregation, Petrochemical need in Printing industry. Toxic compound, Environmental issues in printing facilities- emission to air, waste water, VOC emission, Sources of VOC, Environmental effect of VOC, Steps to reduce VOC emission, Avoiding or minimizing VOC loss.

UNIT-II

Environment Management System: Implementing secondary control, Biochemical based cleaning solvents, Biochemical enhance worker safety. Waste reduction recycling and reuse. Pollution Prevention and Cleaner Production. Particulate matter- Reduction, removal, collection, Contribution by products, Waste material, Chemical hazards, Inhalation, hazardous material management hazards-prevention and control.

Accounting concepts, data collection, evaluation and process operations, ISO 14000 and Life – cycle concepts. Eco Management and Audit system, Life Cycle Assessment

UNIT III

Waste Management: Waste – Collection, sorting, cleaning – Recycling – Overview and growth – Characterization of waste streams – Processing facilities for recyclable materials. Recycling Technique / Methods- Recycling rate, material recovery facilities – Integrating recycling with landfills – Processing equipment. Recycling of Paper, Metals, Plastic and Glass.

Waste Management: Sustainability and global conditions - Material and solid waste management - Energy management -chemical waste management and green chemistry - Climate change and air emissions management - Supply water and waste water management - Environmental business management.

UNIT IV

Need for Green Supply Chain Management (GSCM): Green supply Chains – Need for Green Supply Chains – Implications of modern supply chain management – The supply chain strategy – Ingredients of green supply chain strategy.

Industrial Ecology: Introduction - Material flows in chemical printing - Industrial parks - Assessing opportunities for waste exchanges and by product synergies - Lifecycle concepts - Product stewardship and green engineering - Regulatory, social and business environment for green printing - Metrics and analytical tools - Green supply chains - Present state of green printing.

Text Book and Study Materials:-

1. David Dornfeld, "Green printing fundamental and applications" Prentice hall, 2002.
2. 'Sustainable Supply Chain Management' Balkan Cetinkaya and Richard Cuthbertson (2nd) – Springer 2011
3. Kipphan Helmut, "Hand Book of Print Media", Springer, Germany, 2001.
4. Jones Gary A, "Air Pollution engineering Guide for Graphic Arts Industry", GATF, 1993.
5. Sammy Shinga G., "Green electronics design and printing", Prince Publications, 2008.
6. James clark, "Green chemistry", Blackwell publishing, 2008.
7. Paulo Davim, "Sustainable printing", Wiley publications 2010.
8. Frank Kreith, George Tchobanoglous, "Solid waste management", McGraw Hill, 2002.
9. Stevens S., "Green plastics", Princeton University press, 2002.
10. Robert Ayres U., "A Handbook of Industrial Ecology", Edward Elgar publishing, 2002.
11. Hsiao-fan wang and SurendraM.Gupta Green supply management Product life cycle approach McGraw Hill, 2011.
12. R.Mckinney, "Technology of paper Recycling", Blackie Academic and professional, 1997.
13. Herbert F.Lund, " McGraw-Hill Recycling Handbook", 2nd Edition, 2001
14. John Geis A and Paul Addy L, "Materials handling for the Printer", GATF Press, Pittsburgh, 1999

Course Articulation Matrix:

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

3D PRINTING

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG453-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To provide comprehensive knowledge of various applications of 3D printing.
- To impart knowledge of working of 3D printing machines.
- To give knowledge of various forms of 3D printing and their utilization for various additive manufacturing applications.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of 3D Printing	L1
CO 2	Explain various domains of 3D Printing in different arena	L2
CO 3	Classify various 3D Printing Additive Manufacturing Techniques	L3
CO 4	Point out different 3D Printing Techniques for different applications	H1
CO 5	Select appropriate Additive Manufacturing Techniques for a particular application	H2

UNIT-I

Concept of 3D Printing: Introduction, history of 3D Printing, Technology of 3D Printing, 3D Printing Processes Classifications, Advantages, Additive and Conventional Manufacturing processes, Applications.

Additive Manufacturing Techniques: Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology. Process parameter, Process Selection for various applications. 3D Printing (Additive Manufacturing) Application Areas: Aerospace, Electronics, Health Care, Defense, Automotive, Construction, Food Processing, Machine Tools

UNIT-II

Working of 3D Printing: Introduction, 3D Printing and Conventional Manufacturing, Basics of 3D Printing Process: Creation of Solid Model, Conversion to STL File, Slicing the File, Making the Prototype, Post processing, Problems with the STL File Format.

Various file formats: Modern File Formats i.e. VRML File, AMF File, 3MF File, OBJ File. Older File Formats: 3DS, IGES File, HPGL File CT Data.

UNIT-III

Materials used for 3D Printing: Introduction, Types of Materials: Polymers: Thermoplastic Polymers, Thermosetting Polymers, Elastomers, Metals, Ceramics, Composites, Liquid-Based Materials: Polymers, Metals and Composites. Solid-Based Materials: Polymers, Metals and Composites. Powder-Based Materials: Polymers: Thermoplastics, Polymer Composites, Elastomers, Powders. Metals: Selective Laser Sintering, SLS and Hot-Isostatic Pressing, Direct Metal Laser Sintering, Direct Metal Deposition. Ceramics: Aluminum Oxide, Zirconium Oxide.

Common Materials Used in 3D Printers: PLA, ABS, PC, Polymides (Nylon). Materials Selection Considerations: Application, Function, Geometry, Post processing

UNIT-IV

Classification of 3D Printing Systems: Introduction, FDM Systems: Stratasys RP Machines, Principles of FDM, The FDM Process, Machines, Stratasys J-750, Stratasys Dimension Elite, Stratasys Objet Eden260VS , FDM 3D Printing, Maker Bot Replicator. SLA Systems: The Details of SLA Process, SLA Process, SLA 3D Printing. SLS Systems: SLS Overview. 3D Systems s Pro 60 HD, Sinterit Lisa SLS 3D Printer.

Thermal Inkjet Printing Systems: Stratasys Polyjet Connex3 Inkjet 3D Printer.

Text & Reference Books:

1. 3D Printing: The Next Industrial Revolution, by Christopher Barnatt, Create space – 2013.
2. Rapid Prototyping: Principles and Applications by Chu Sing Lim, World Scientific Publishing Company, 2010.
3. '3D Printing: Technology, Applications and Selection' by Rafiq Noorani, Taylor & Francis, 2018.
4. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi

Course Articulation Matrix:

Program Outcome (PO)													PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	2	1	-	1	-	-	1	-	1	1	2	3	2	1
C02	3	2	2	-	-	-	-	-	-	-	1	2	3	2	2
C03	3	2	1	-	-	-	-	1	-	1	1	2	2	3	1
C04	4	3	1	-	1	-	-	-	-	-	1	2	3	2	2
C05	3	2	2	-	-	-	-	-	-	1	2	2	3	2	1

PATENTS AND IPR

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG454-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To provide comprehensive knowledge to apply for patents and IPR.
- To impart knowledge of various laws related to IPR and patents.
- To give knowledge of trademark registration.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe the concept of patents and IPR	L1
CO 2	Explain various Trade related Intellectual Property Rights	L2
CO 3	Demonstrate various laws related to patents and IPR	L3
CO 4	Identify trademark for different brands and packaging applications	H1
CO 5	Appraise appropriate process for trade mark registration	H2

UNIT-I

Introduction to Intellectual Property Law- Evolutionary past - Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights - Agencies Responsible for Intellectual Property Registration - Infringement - Regulatory - Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT-II

Introduction to Copyrights- Principles of Copyright - Subject Matters of Copyright - Rights Afforded by Copyright Law -Copyright Ownership - Transfer and Duration - Right to Prepare Derivative Works -Rights of Distribution - Rights of performers - Copyright Formalities and Registration - Limitations - Infringement of Copyright - International Copyright Law-Semiconductor Chip Protection Act.

Introduction to Cyber Law- Information Technology Act - Cyber Crime and E-commerce - Data Security - Confidentiality - Privacy - International aspects of Computer and Online Crime.

UNIT-III

Introduction to Patent Law- Rights and Limitations - Rights under Patent Law - Patent Requirements - Ownership and Transfer - Patent Application Process and Granting of Patent - Patent Infringement and Litigation - International Patent Law - Double Patenting - Patent Searching - Patent Cooperation Treaty - New developments in Patent Law- Invention Developers and Promoters.

UNIT-IV

Introduction to Trade Mark- Trade Mark Registration Process - Post registration procedures - Trade Mark maintenance - Transfer of rights - Inter parties Proceedings - Infringement - Dilution of Ownership of Trade Mark - Likelihood of confusion - Trade Mark claims - Trade Marks Litigation - International Trade Mark Law.

Introduction to Trade Secrets- Maintaining Trade Secret - Physical Security - Employee Access Limitation - Employee Confidentiality Agreement - Trade Secret Law - Unfair Competition - Trade Secret Litigation - Breach of Contract - Applying State Law.

Text & Reference Books:

1. Intellectual Property by Deborah E.Bouchoux. Cengage learning.
2. Fundamentals of IPR for Engineers (BS Publications) By KompalBansal&ParishitBansal.
3. Intellectual Property Rights (Tata Mc-Graw – Hill Publication) By PrabhuddhaGanguli
4. Intellectual Property by Richard StimCengage Learning.
5. Intellectual Property Rights, By R. Radha Krishnan, S. Balasubramanian Excel Books

Course Articulation Matrix:

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

PEC-V (PROGRAM ELECTIVE COURSE- V)

PEC-V (Lab), (PROGRAM ELECTIVE COURSE- V Lab.)

Student will select one subject from the list of course available in PEC-V list PEC-PTG551-T/ PEC-PTG552-T/ PEC-PTG553-T/ PEC-PTG554-T and PEC-PTG551-P/ PEC-PTG552-P/ PEC-PTG553-P/ PEC-PTG554-P. Subject will be offered from the department of printing technology. Detailed syllabus is attached here with.

WEB OFFSET PRINTING

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG551-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart knowledge of basics of web-fed offset printing process.
- To understand mechanical and technical aspects of web-fed offset printing machines.
- To have better understanding of operations and applications of web-fed offset printing in modern era.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe the concept and types of web offset printing.	L1
CO 2	Explain various components of web offset printing machines.	L2
CO 3	Demonstrate various inking and dampening systems of web offset.	L3
CO 4	Identifying various defects of web offset presses.	H1
CO 5	Determine the appropriate auxiliary equipment used in web offset printing.	H2

Unit-I

Web Offset Printing: Introduction to Web Offset Printing Machines, Evolution and History of Web Fed Offset Presses, types of Web Offset presses, Characteristics of Web fed offset printing, Differentiate between Web Offset and Sheet fed Offset, Components of web offset press, Handling of Rolls.

In-feed and Tension Control: Infeed, Roll Stand Splicing Mechanism- Manual, Semi-automatic and fully automatic, Guide Rollers and Tension control essentials, Compensator, Registration arrangement, Introduction to Printing Unit and Out-feed Unit.

Unit-II

Dampening and Inking System- Dampening Units, Rollers and their functions, types of dampening system for web offset, Inking Units, Rollers and their functions, types of inking system for web offset, Setting of dampening and inking units. Types of Web offset inks.

Printing Unit-Introduction to 3 cylinder system, Plate cylinder, Blanket cylinder, Impression cylinder, Types of Printing Units for Web offset Printing- Mono, Perfecting, CI Units, Stack, Inline and 4 High, Concept of printing tower, Introduction to single colour printing, Double side printing, Perfecting with 4 Colour Units (4 High Printing). Requirement of web paper, Paper properties versus printability.

Unit-III

Out-feed and Delivery Unit: Introduction to out-feed unit, folders, types of folders- Former fold, Jaw folder, chopper folder, quarter folder, inline numbering, concept of folder ratio, Web to web, web to sheet, Drive systems used in web-fed offset machines

Heat-set Unit: Introduction to Heat-set machines, applications, requirement, uses, applications, Inks for Heat-set machines, Printing on coated and glazed substrates, Dryer and Chill Rolls.

Defects and Remedies: Web offset printing defects, causes, remedies, precautions, troubleshooting.

Unit-IV

Auxiliary Equipment–Press controls , Plate scanners, scanning densitometer, closed-loop system, web pre-conditioners, sheet cleaners, ink agitators, water coded ink oscillators, fountain solution recirculation systems, fountain solution mixers, refrigerating fountain solution, automatic blanket washers, side lay sensors, web break defectors, remoisturizers-liquid applicator system, roller applicators systems, antistatic devices, Imprinters, Perfectors, cutoff controls, straboscope, synchroscope

Inline Finishing - Introduction, gluers, paster wheels, remoisterable pattern gluers, segmented gluers, envelope pattern gluers, backbone gluers. Pattern perforating and numbering units-sheeters, variable rotary cutters, Recent advancements in web offset printing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	2	1	1	2	-	1	-	-	-	1	1	3	2	1
C02	3	2	1	-	2	-	1	-	-	-	-	1	3	2	1
C03	3	2	1	-	2	-	1	-	-	-	-	1	3	2	1
C04	3	2	1	-	2	-	1	-	-	-	-	1	3	2	1
C05	2	2	2	1	2	-	1	-	-	-	-	1	3	2	3

WEB OFFSET PRINTING LAB

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG551-P</p> <p>Course Credit: 1</p> <p>Contact Hours: 3/week, (L-T-P:0-0-2)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration:2 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of web-fed offset printing process.
- To provide hands-on experience of web-fed offset printing machines.
- To provide learning for operations of various components for running web-fed offset printing presses.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe the concept and types of web offset printing	L1
CO 2	Explain various components of web offset printing machines	L2
CO 3	Demonstrate various inking and dampening systems of web offset	L3
CO 4	Identifying various defects of web offset presses	H1
CO 5	Determine the appropriate auxiliary equipment used in web offset printing	H2

List of Practical:-

1. Various components of web fed offset printing machine.
2. Pre -make ready operations
3. Make ready operations
4. Blanket, Plate and Impression cylinder setting
5. Damping roller setting.
6. Inking roller setting
7. Operations of various folders used in web offset machines
8. Tension control, web-breaks and printing problems
9. Drive system of web offset machine (both mechanical and electrical).
10. Lubrication system of Web offset machine.
11. Trouble shooting during printing.

Course Articulation Matrix:

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

PACKAGING TECHNOLOGY

General Course Information	
<p>Semester-VIII</p> <p>Course Code: : PEC-PTG552-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures and Tutorials</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart technical knowledge of various domains of packaging.
- To inculcate the concepts of package design and product-package interaction.
- To conceptualize the approaches of packaging for different products.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of Packaging and its utility.	L1
CO 2	Explain various domains of Packaging in different arena	L2
CO 3	Classify various Packaging on the bases of materials to be packaged	L3
CO 4	Identifying different technical parameters to be considered while packaging	H1
CO 5	Rate different approaches of packaging for different products	H2

UNIT-I

Concept of Packaging: Introduction, definition, need and evolution of Packaging, Various functions and classification of Packaging, Various Packaging hazards

Designing in Packaging: Importance and features of an effective package design, Package colour, various graphics elements used for while Packaging. Product-package compatibility: Product Characteristics (Physical, Chemical and Biological) and Package Characteristics (Physical and Biological) Concept of Permeability.

UNIT-II

Corrugation in Packaging: Introduction to corrugation board, Types of Corrugated boards, flutes and its types, Corrugating machines.

Metal Packaging: Introduction to metal packaging, common formats of Metal cans: Three Piece can, Two Piece Can, Manufacturing of welded cans: Three Piece welded cans, two piece single drawn and multiple drawn cans, two pieces drawn and wall ironed cans, two piece impact extruded cans

UNIT-III

Cosmetic Packaging: Introduction to packaging of pharmaceutical products, Classification of pharmaceuticals.

Glass Packaging: Introduction to glass, Selection of glass as packaging materials for the pharmaceutical products, Advantages and disadvantages of glass containers, Properties of glass, Production of glass, Types of glass, Manufacturing of Glass containers, testing of glass containers

UNIT-IV

Active and Intelligent Packaging: Active packaging techniques, intelligent packaging techniques, Current use of novel packaging techniques, Consumers and novel packaging.

Aerosol Packaging: Introduction and its types. Blister packaging: Introduction to blister package, Blister design parameters, Materials, Types of Blisters, Advantages and disadvantages of Blister Packaging Raw Materials of Plastics

Text & Reference Books:

1. **Fundamentals of Packaging Technology** by Soroka, IoPP, 2002.
2. **Packaging Technology** Byett J. et al., 2nd Ed, The Institute of Packaging (SA), 2001.
3. **The Wiley Encyclopedia of Packaging Technology** by Yam K. L. Third Edition, Wiley, 2009.
4. **The Packaging User's Handbook Paine** by F. A., 1st Ed, Blackie Academic & Professional, 1991
5. **Packaging Technology – Fundamentals, materials and processes**, Woodhead Publishing, 2012
6. **Hand-Book of Packaging Technology**, Printed and Published by Sudhir Gupta for “Engineers India Research Institute”, EIRI Board of Consultants & Engineers.

Course Articulation Matrix:

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

PACKAGING TECHNOLOGY LAB

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG552-P</p> <p>Course Credit: 1.0</p> <p>Contact Hours: 3/week, (L-T-P:0-0-2)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration:2 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To impart the practical knowledge of various domains of packaging.
- To inculcate the practical concepts of package design and product-package interaction.
- To conceptualize the approaches of packaging for different products practically.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of Packaging and its utility.	L1
CO 2	Explain various domains of Packaging in different arena	L2
CO 3	Classify various Packaging on the bases of materials to be packaged	L3
CO 4	Identifying different technical parameters to be considered while packaging	H1
CO 5	Rate different approaches of packaging for different products	H2

List of Practical:-

1. Designing of rigid packages
2. Designing flexible packages
3. Designing of glass containers
4. Designing of metal containers
5. Designing of cosmetic packages
6. Designing of corrugated box
7. Designing of blister packaging
8. Designing of novel packaging
9. Designing of pharmaceutical package, its elements and consideration for designing of pharmaceutical packages
10. Introduction to industrial package, its elements and consideration for designing of industrial packages
11. Testing of flexible packages
12. Testing of rigid packages
13. Testing of various hazards on packages

Course Articulation Matrix:

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

DIGITAL PRINTING

General Course Information	
Semester-VIII Course Code: PEC-PTG553-T Course Credit: 3 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart the knowledge of basics of digital printing process.
- To understand mechanical and technical aspects of digital printing machines.
- To have better understanding of operations and applications of digital printing in modern era.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe various Digital Workflows and technologies in Digital Printing	L1
CO 2	Explain Digital Proofing techniques and evaluation of Quality tools and standards	L2
CO 3	Classify the different applications of Digital Printing	L3
CO 4	Identify and print process jobs in digital workflow, Pre-flight and produce proofs and create films and plates	H1
CO5	Access the knowledge of recent trends, future implications and applications of Digital Printing presses to both consumers and printing & packaging industry	H2

UNIT I

Digital Printing Technologies: Overview of digital printing, electro photography, ink-jet (Thermal, piezoelectric, continuous), Thermography, computer-to-technologies. Direct imaging printing systems- once imageable, re-imageable masters

Digital Prepress:Image Acquisition- Scanner types: –Drum, flatbed. Dynamic range, Resolution, Storage, File formats. Digital Camera – Principles, mechanisms, types, resolution, memory.

UNIT II

Digital Workflow:Receiving jobs, Pre-flighting, Scanning, File formats, JDF, XML, AdsML, PDF. Electronic trapping and imposition software. Screening techniques, raster image processor (RIP), workflow integration, color management, Archiving, corrections, conversion, image replacement, APR, OPI servers, networking.

Digital Proofing Technologies: Digital proofing – Need, Proofing technologies – Ink jet, Dye sublimation, Thermal Wax, Electro photography. Halftones,simulation (dot proofing), remote proofing, preflight, SWOP/GRACoL, G7 certification for proofing systems.

UNIT III

Evaluation of Quality: objective (colorimetric) and subjective (visual) assessment of printing technology (devices), image quality attributes, print quality verification tools, standardization - ISO,SWOP, GRACoL, G7

Variety of Applications: customization and direct marketing, Print-On-Demand (POD), variable data printing (VDP), distribute-and-print, remote publishing (Web2Print), wide-format printing, specialty applications (particularly of inkjet) like 3D printing, printing on microscopic items etc. Trends in Digital Printing

UNIT IV

Computer Networks: Networks for printing. Networks for publishing. Networks for in-house.IdealNetwork.WAN (Wide Area Networks). Flexibility. Changing Markets for Print. Market projections, projections of changes in the no. of colors.Moving towards shorter runs.

Print Engines: Overview about Print engines. Press director. Multiple runs. Open pre-press interface. Color consistency. User experience. Service. Cost of consumables. Rip station, Satellite press, Web press software suit.

Test books and reference book:

1. Frank Cost, “Pocket guide to digital Printing”, Delmar Publishers, 1997.
2. T.E. Schildgen, “Pocket guide to colour with digital application”. Delmar Publishers, 1998.
3. David Bergsland, “Printing in a digital world”, Delmar Publishers, 1997.
4. Michael Limburg, “Gutenberg goes digital”, Blue Print, 1955.
5. Anton & Peter Kammermeter, “Scanning & Printing”, “Focal press, 1992.
6. Robin Mcallister, “Scanning & Image manipulation”, Delmar Publishers, 1997.
7. Robin McAllister, “Colour”, Delmar Publishers, 1997.

8. Phil Green, "Understanding digital colour", Blueprint, 1995.
9. Brett, G, Digital Prepress Technologies, Leatherhead: Pira International, 2001.
10. Brett, G, Short-run Digital Colour Printing, Leatherhead: Pira International, 2001.
11. H. Kipphan, Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg, 2001.
12. Lake, M., The future of Digital Colour Printing: Key global markets and Forecasts, Leatherhead: Pira International, 2004.
13. Martin, G., Non-impact Printing, Leatherhead: Pira International, 1993.
14. Smyth, S., Digital Commercial Printing, Leatherhead: Pira International, 2001.
15. ABCs of Variable Data Printing, Published by EFI.
16. Howard M Fenten. Frank. J. Romano.- On Demand Printing

Course Articulation Matrix:

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

DIGITAL PRINTING LAB

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG553-P</p> <p>Course Credit: 1.0</p> <p>Contact Hours: 3/week, (L-T-P:0-0-2)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration:2 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of digital printing process.
- To provide hands-on experience of digital printing machines.
- To provide learning for operations of various components for running digital printing presses.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Describe various Digital Workflows and technologies in Digital Printing	L1
CO 2	Summarize Digital Proofing techniques and evaluation of Quality tools and standards	L2
CO 3	Use the different applications of Digital Printing	L3
CO 4	Identify and print process jobs in digital workflow, Pre-flight and produce proofs and create films and plates	H1
CO5	Determine knowledge about recent trends, future implications and applications of Digital Printing presses to both consumers and printing & packaging industry	H2

List of Practical:-

1. Testing of various digital printing techniques and their applications
2. Testing of digital image acquisition and various file formats
3. Testing of digital printing workflows
4. Testing of pre-flight techniques used in digital pre-press
5. Testing of digital printing software
6. Testing of digital proofing techniques
7. Evaluation of digital print quality
8. Quality control equipment and their handling
9. Various applications of print-on-demand, variable data printing and digital printing
10. Introduction to various digital print engines
11. Digital press standardization using ISO, SWOP, GRACoL and G7 specifications

Course Articulation Matrix:

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

COLOUR MANAGEMENT

General Course Information	
<p>Semester-VIII</p> <p>Course Code:PECPTG554-T</p> <p>Course Credit: 3.0</p> <p>Contact Hours: 3/week, (L-T-P:3-0-0)</p> <p>Mode: Lectures</p> <p>Examination Duration: 3 Hours</p>	<p>Course Assessment Methods; (Internal Examination: 30 marks)</p> <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks. <p>Course Assessment Methods; (End Semester Examination: 70 marks)</p> <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give comprehensive knowledge of concepts of colour management and its importance in printing industry.
- To impart knowledge of ISO, BIS and other colour management standards used in printing industry.
- To provide knowledge about various colour management tools and methods.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of colour management and its utility.	L1
CO 2	Distinguish different colour models and their importance in printing arena	L2
CO 3	Use different sophisticated colour measuring instruments/devices	L3
CO 4	Comparison among different technical printing parameters.	H1
CO 5	Evaluate different printing parameters using spectro-photometric colour measuring instruments	H2

UNIT-I

Colour Science: Defining Colour, fundamentals of Colour, Colour and Light, Colour vision and perception, Metamerism, Color vision Testing, Additive and subtractive colour theory

Colour Management: Introduction, WYSIWYG, and need for colour management, Three Cs of color management, colour management systems, colour management workflow, Color Spaces - device dependent and independent color spaces, New age colour management software- Fierry, Curve, Star pro, I Profiler, ICC profiles, Introduction to G7, Commands of Colour measuring software

UNIT-II

Colour definition and measurement: Colour dimensions, Munsell Color system, defining colour by measurement: Spectral reflectance, CIE colour standards: illuminants, CIE standard observer, Tri-stimulus values, Chromaticity Values, Color Temperature, memory colour

Colour Measuring instruments: Density and densitometer, colorimeter and spectrophotometer, il Pro, iliO, Commands of Colour measuring instruments

UNIT-III

Measurement of Print Characteristics: Colour density, Dot Gain (TVI): Dot area measurements using Murray Davies equation and Yule-Nielson equation, Slur and doubling, characteristics curve for dot area and dot gain, Print contrast: relative print contrast measurement, Ink trapping: trapping measurement, Hue error, percent grayness and measurement.

Various elements required for different print characteristics: Print control strip, Ink colour and film thickness elements, trapping elements, gray balance elements, slur and doubling elements.

UNIT-IV

Colour Models Family: Munsell, CIE Colour Model Family: CIE Colour Space, CIE XYZ Colour Space, CIE L*U*V* Colour Space, CIE L*a*b Colour Space, Define Delta E. Demonstrate how to calculate it and how to use it, RGB colour model, CMYK colour model, HSI Family: HSI/HSV Colour Model, HSL Colour Model. YUV Family: YUV Colour Model, YIQ Colour Model, YCbCr Colour Model, Conversion between colour models.

Colour Separation in Printing: Need of colour separation, methods of colour separation: direct colour separation, indirect colour separation and electronic colour separation, Concept of UCR, GCR.

Text & Reference Books:

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

Course Articulation Matrix:

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

COLOUR MANAGEMENT LAB

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PEC-PTG554-P</p> <p>Course Credit: 1.0</p> <p>Contact Hours: 3/week, (L-T-P:0-0-2)</p> <p>Mode: Practical & Lab work</p> <p>Examination Duration: 2 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives: -

- To give practical knowledge of colour management and its importance in printing industry.
- To impart practical knowledge of ISO, BIS, G7 and other colour management standards used in printing industry.
- To provide practical knowledge about various colour management tools and methods.

Course Outcomes: -

Sr. No.	Course Outcomes At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of colour management and its utility.	L1
CO 2	Explain the different colour models and their importance in printing arena.	L2
CO 3	Compare different sophisticated colour measuring instruments/devices.	L3
CO 4	Comparison among different technical printing parameters.	H1
CO 5	Evaluate different printing parameters using spectro-photometric colour measuring instruments.	H2

List of Practical:

1. Practical exposure to additive and subtractive colour theories and their applications.
2. Understanding concept of Colour Separation- Conventional and Digital
3. Study Direct Colour Separation.
4. Study Indirect Colour Separation.
5. Study Electronic Colour Separation.
6. Understanding UCR (under Color Removal) and GCR (Gray Component Replacement).
7. Study different Color Model Family.
8. Study of colour measurement instrument- Colorimeter, Spectrophotometer, Densitometer, iliO, il Pro
9. Study of colour management software-Fierry, Star Pro, I profiler etc.
10. Study of ICC profiles and colour gamut for different printing processes and substrates
11. Study of various colour specifications- UGRA, FOGRA, GRACOL, SWOP, G7, ISO 12647 etc.
12. Introduction and comparison to various international colour standards.

Course Articulation Matrix:

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

COSTING AND ESTIMATION IN PRINTING

General Course Information	
Semester-VIII Course Code: PCC-PTG-402-T Course Credit: 5.0 Contact Hours: 3/week, (L-T-P:3-2-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To give comprehensive knowledge of concepts of costing and estimation in printing organizations.
- To impart knowledge various mathematical tools and techniques for costing and estimation of raw material consumption.
- To provide knowledge about various cost control and cost minimization methods.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe the concept of Costing and Estimating	L1
CO 2	Express adequate process to improve cost efficiency	L2
CO 3	Generalize about cost controlling and planning different jobs	L3
CO 4	Distinguish different printing and binding materials and to prepare production budget	H1
CO 5	Appraise the optimization of system by cost control and cost reduction	H2

UNIT-I

Costing and Estimating: Cost, Price and Profit, Concept of Costing and Estimating, Difference between costing and estimating, relationship between costing and estimating, purpose and function of costing, purpose and function of estimating.

UNIT-2

Elements of Cost: Directly Chargeable Cost and Indirectly Chargeable Cost, Labour, Material and Outwork, Expenses, Methods of cost recovery, Fixed Cost and Variable Cost, Costing System- Objective, types of Costing System, Printer's Estimator- qualifications of an estimator, working environment, estimator's tools, Federation Costing system, Various forms and proformaes and their importance: WIT (Work Instruction Ticket), Daily Docket Sheet, Cost Sheet.

Estimating Ink: Ink consumption formula (SPANKS Formula) for mono colour printing and four process colour printing, Ink allowance for spoilage, Numerical problems based of estimating ink.

UNIT-3

Estimating Paper and Substrates: Paper and its various sizes- conventional size and international sizes with their subdivision, RA&SRA sizes, advantages of ISO paper sizes over conventional paper size, selection of paper, allowance for wastage, allowance for trimming, Weight of loose sheets, weight of a reel of paper with formula derivation

Estimating Flexible Substrates: Introduction to the weight of a reel of flexible material with formula derivation, equivalent weight of flexibles, Numerical problems based of estimating flexibles.

UNIT-4

Estimating Binding Materials: Board requirement, estimating covering materials, estimating sewing thread, estimating stitching wire, estimating adhesives Numerical problems based of estimating binding materials

Costing and Estimation Software: Introduction to costing and estimation software, Print Production Planning software, Facilities, Advantages and Limitations.

Recommended Books :

- Printer's Costing & Estimating - **B. D. Mendiratta**
- Estimating Methods and Cost Analysis for Printers - **K. S. Venkataraman, K. S. Balaraman.**
- Printing Estimating Principle & Practice - **Philip Kent Ruggles**
- Print Production Management - **Gray G. Field**
- Principles of Applied Costing for Printing Industry - **K. S. Venkataraman.**

Course Articulation Matrix:

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

ADVANCED SCREEN PRINTING

General Course Information	
Semester-VIII Course Code: PCC-PTG404-T Course Credit: 3.0 Contact Hours: 3/week, (L-T-P:3-0-0) Mode: Lectures Examination Duration: 3 Hours	Course Assessment Methods; (Internal Examination: 30 marks) <ul style="list-style-type: none"> • Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered. • Class performance will be measured through percentage of lectures attended (04 marks). • Assignments, quiz etc. will have weightage of 06 marks.
	Course Assessment Methods; (End Semester Examination: 70 marks) <ul style="list-style-type: none"> • 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. Two questions are to be set from each unit. All questions will carry equal marks. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.

Course Objectives: -

- To impart the knowledge of basics of screen printing process.
- To understand mechanical and technical aspects of screen printing machines.
- To have better understanding of operations and applications of screen printing in modern era.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Describe various aspects of screen printing.	L1
CO 2	Explain various stencil preparation methods.	L2
CO 3	Examine various substrates for screen printing.	L3
CO 4	Identify the applications of screen printing.	H1
CO 5	Determine the suitable screen-printing drying mechanisms.	H2

Unit-1

Introduction: Evolution and history of Screen printing process, Screen printing scenario in India and abroad, Introduction to Screen printing, nature and scope, applications of screen printing, uses, applications, advantages, limitations, Introduction to screen printing machines, manual, semiautomatic and automatic for different substrates and applications, Screen printing defects- Causes, Remedies and Precautions.

Unit-2

Screen Printing Equipment and Accessories- Layout, set-up and essentials of Screen Printing Presses, Various components of screen printing, types of screen printing, modes of taking impression for screen print, Screen printing equipment and accessories- printing table, screen frames, screen mesh, squeeze and its considerations, drying racks, screen fabric, wire mesh, baseboard, stretching screen fabric to frame, screen printing material, care and maintenance of screens.

Techniques of Preparing Stencils: Techniques of preparing stencils, Manual methods- Hand cut, Blocking out method, Photographic Methods- Direct, Indirect, Direct/Indirect

Unit-3

Specialized Screen Printing- Specialized areas of screen printing- paper and paperboard, textile and jute, glass and ceramics, plastics, wood, metals and metal foils, circuit boards, rotary screen printing, printing on industrial containers and hazardous materials, Alternates to screen prints for specific applications, membrane keyboards, RFID antennas and other applications, wide area displays

Substrates for Screen Printing- Various Substrates for Screen printing, characteristics, Printing on Balloons, Clothing and Textile, Medical devices, Printed electronics-including circuit board printing, Product labels, Signs and displays, Textile fabric, Thick film technology, Printing on Bio-degradable materials

Unit-4

Ink and solvents for screen printing: Various Ink and solvents for screen printing, characteristics of screen printing inks, Types and classifications, job and substrate specific ink, screen printing presses and drying systems- drying racks, wicket dryers, jet dryers, infrared dryers, UV dryers, Screen reclamation- Troubleshooting of clogged screens

Recent Developments in Screen Printing- Developments in Screen Printing, growth rate and potential of field, future prospective for upcoming print requirements, Entrepreneurship opportunities in the field of Screen printing

Reference Books:

1. Technology of Screen Printing by B.D. Mendiratta
2. Printing Technology By Adams, Faux, Rieber, 5th edition
3. Screen Printing Review by Samuel Hoff

Course Articulation Matrix:

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

ADVANCED SCREEN PRINTING LAB

General Course Information	
<p>Semester-VIII</p> <p>Course Code: PCC-PTG404-P</p> <p>Course Credit: 1.5</p> <p>Contact Hours: 3/week, (L-T-P:0-0-3)</p> <p>Mode: Practical & Lab Work</p> <p>Examination Duration: 3 Hours</p>	<p>Internal: 50 Marks; External: 50 Marks</p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Course Objectives:-

- To impart practical knowledge of basics of screen printing process.
- To provide hands-on experience of screen printing machines.
- To provide learning for operations of various components for running screen printing presses.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Describe various aspects of screen printing.	L1
CO 2	Explain various stencil preparation methods.	L2
CO 3	Examine various substrates for screen printing.	L3
CO 4	Identify the applications of screen printing.	H1
CO 5	Determine the suitable screen-printing drying mechanisms.	H2

List of Experiments: -

1. Study of various types of screen presses- manual, semi-automatic and automatic.
2. Study of Screen stretching techniques.
3. Study of Stencil Preparation Methods - Direct
4. Study of Stencil Preparation Methods–Indirect
5. Study of Stencil Preparation Methods- Direct/Indirect.
6. Printing on various substrates
7. Study of care and maintenance of Screens
8. Study of Screen-Printing Defects
9. Study of Screen-Printing Inks and solvents and shade matching
10. Study of Screen-Printing Drying mechanisms

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

PROJECT-II

General Course Information	
Semester-VIII Course Code: PROJ-PTG402-P Course Credit: 4.0 Contact Hours: (L-T-P: 0-0-8) Mode: Project/Practical Examination Duration: 3 Hours	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Internal practical evaluation is to be done by respective project guide. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives: -

- To inculcate manufacturing and fabrication skills for small printing machines/equipments used in printing industry.
- To enhance technical, financial, interpersonal and communication skills among students.
- To convert ideas and technical knowledge into practical applications.

Course Outcomes: -

Sr. No.	Course Outcomes	RBT Level
	At the end of the semester, students will be able to :	
CO 1	Recognize the importance of major techniques and processes used in printing industry.	L1
CO 2	Demonstrate convert technical knowledge into practical applications	L2
CO 3	Determine the art of planning, conceptualization and implementation of ideas to objects/techniques/learning resources.	L3
CO 4	Point out the art to deliver technical presentations	H1
CO 5	Justify the technical, financial, interpersonal and communication skills among students.	H2

Guidelines: -The concept of project work will be started by a group of maximum 7 students under the guidance of project guide (faculty member) already allotted in 7th Semester for Project-I. The purpose of Project-II is to inculcate manufacturing and fabrication skills for small printing equipments in continuation with Project-I. It is mandatory to submit at least one machine/equipment in working condition to respective project guide and demonstration of the same in front of external examiner. The machine/equipment is to be submitted along with PPT and project report. It is mandatory requirement to submit the following for Project-II:-

1. Machine/Equipment in the working condition
2. Project Report duly Signed by Project Guide
3. PPT to be submitted in Hard and Soft mode

Course Articulation Matrix:

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

SEMINAR

General Course Information	
Semester-VIII	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)
Course Code: PROJ-PTG404-P	Internal practical evaluation is to be done by respective seminar guide. The end semester practical examination will be conducted jointly by external and internal examiners.
Course Credit: 2.0	
Contact Hours: (L-T-P: 0-0-4)	
Mode: Seminar/Practical	
Examination Duration: 3 Hours	

Course Objectives: -

- To inculcate manufacturing and fabrication skills for presenting the seminar on latest printing technology topics other than syllabus.
- To enhance technical, interpersonal and communication skills among students.
- To convert ideas and technical knowledge into practical applications.

Course Outcomes: -

Sr. No.	At the end of the semester students will be able to :	RBT Level
CO 1	Describe the importance of technical terms used in printing industry.	L1
CO 2	Express the technical terms with relevance.	L2
CO 3	Generalize the art of preparation of technical presentations	L3
CO 4	Appraise the art to deliver technical presentations	H1
CO 5	Justify the technical and communication skills among students.	H2

Guidelines:-The very basic purpose of seminar is to inculcate technical skills, communication skills and presentation skills in the students. The concept of seminar will be started by a group of maximum 7 students under the guidance of project guide (faculty member). One technical topic from recent developments in the field of printing, packaging and allied fields will allotted by the concerned seminar guide and the same will be evaluated by and external and internal examiner.

It is mandatory requirement to submit the following for Seminar:-

1. Seminar Report duly Signed by Seminar Guide
2. PPT
3. Samples (if any)

Course Articulation Matrix:

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