SCHEME & SYLLABUS

M. Tech.

(PRINTING TECHNOLOGY)

w.e.f. 2022-24 Batch Onwards

Department of Printing Technology,

Guru Jambheshwar University of Science and Technology,

Hisar - 125001

(Haryana)

(Established by State Legislature Act 17 of 1995)

'A' GRADE NAAC ACCREDITED UNIVERSITY

SCHEME OF STUDIES AND EXAMINATIONS
M. TECH. (PRINTING TECHNOLOGY), 2022-24 batch Onwards

DEPARTMENT OF PRINTING TECHNOLOGY
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR
'A' Grade, NAAC Accredited
Scheme & Syllabus of M. Tech. — Printing Technology, w.e.f. Session 2022-2024

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 advanced 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 for research and innovations.

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

M. Tech. (Printing Technology)
Programme Educational Objectives (PEO)

PEO 1 :

Post Graduate technocrats will have the expertise of phenomenal principles and modern techniques to cope up with state-of-art technology.

PEO 2 :

To develop post graduate technocrats with a strong foundation in the areas of Printing Technology.

PEO 3 :

To equip the print technocrats with deep awareness of ethical responsibilities in profession.

DEPARTMENT OF PRINTING TECHNOLOGY
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR
'A' Grade, NAAC Accredited

Programme Outcomes (PO)
M. Tech. (Printing Technology)

PO 1: Ability to apply knowledge of state-of-art techniques in Printing Technology.

PO 2: Ability to analyze a problem, identify and define appropriate solution to it.

PO 3: Ability to design, implement and evaluate a print centric system to meet desired needs with appropriate societal considerations.

PO 4: Ability to conduct observations, interpret data and provide conclusions in solving complex problems related Printing Technology.

PO 5: Ability to use appropriate techniques, skills and modern tools necessary for preparing print entrepreneurs.

PO 6: Ability to safety and legal aspects in technology management related issues.

PO 7: Ability to practice knowledge of the impact of professional engineering solutions in environmental concern.

PO 8: An understanding of professional, ethical, security and social issues and responsibilities.

PO 9: Ability to perform effectively as team member and leader both in different circumstances.

PO 10: Ability to communicate effectively on complex engineering perspectives.

PO 11: Ability to demonstrate knowledge on project management principles and research aptitudes.

PO 12: Ability to impart sustainable professional knowledge for future printing needs.

1ST YEAR (1ST SEMESTER)

Course No.	Course title	Teaching Schedule				Credit	Evaluation Scheme		
		L	T	P	Total Hours		Int.	Ext.	Total
MTPT -701	Graphics in Printing and Packaging	3	1		4	4	30	70	100
MTPT -702	Print and Packaging Material and Testing	3	1		4	4	30	70	100
MTPT -703	Newspaper and Multimedia Technologies	3	1		4	4	30	70	100
MTPT -704	Print Entrepreneurship	3	1		4	4	30	70	100
MTPT-705	Advanced Print Finishing Techniques	3	1		4	4	30	70	100
MTPT– 706	Digital workflow Lab			6	6	3	50	50	100
AC-1	Audit Course-1 (Choose any one)	2	-	-	2	N.C	30	70	100 (Qualifying Only)
	Total	15	5	6	28	23	Total Marks:- 600		

1ST YEAR (2ND SEMESTER)

Course No.	Course title	Teaching Schedule				Credit	Evaluation Scheme		
		L	T	P	Total Hours		Int.	Ext.	Total
MTPT- 711	Modern Printing Systems	3	1		4	4	30	70	100
MTPT- 712	Digital Imaging Techniques	3	1		4	4	30	70	100
MTPT- 713	Advanced Quality Control and Instrumentation	3	1		4	4	30	70	100
MTPT- 714	Print Technology Management	3	1		4	4	30	70	100
MTPT- 715	Modern Security Printing	3	1		4	4	30	70	100
MTPT- 716	Print Machine Maintenance Lab			6	6	3	50	50	100
AC-2	Audit Course-2 (Choose any one)	2	-	-	2	N.C	30	70	100 (Qualifying Only)
MTPD	Motivational Talk and Personality Development								
	Total	15	5	6	28	23	Total Marks:- 600		

2ND YEAR (3RD SEMESTER)

Course No.	Course title	Teaching Schedule				Credit	Evaluation Scheme		
		L	T	P	Total Hours		Int.	Ext.	Total
3OE	Open Elective (Choose any one)	3	-	-	3	3	30	70	100
MTPT- 721(A) /MTPT 721 (B)	Program Elective (Choose any one)	3	1		4	4	30	70	100
MTPT -722	Major Project (Part-I)	3	1	2	6	5	30	70	100
MTPT- 723	Print and Packaging Quality Control Lab.			6	6	3	50	50	100
	Total	9	2	8	19	15	Total Marks:- 400		

2ND YEAR (4TH SEMESTER)

Course No.	Course title	Teaching Schedule				Credit	Evaluation Scheme		
		L	T	P	Total Hours		Int.	Ext.	Total
MTPT-731	Major Project (Part-II)	5	1	6	12	9	30	70	100
	Total	5	1	6	12	9	Total Marks:- 100		

Program Elective:-

MTPT- 721 A	Maintenance Management.
MTPT-721 B	Modern Packaging Technology.

Audit Courses/Open Electives for M. Tech.
(2018 batch onwards)

List of Audit Courses 1 (1st Semester-Non Credit):

Sr. No.	Course	Code	To be Taught by Department	Time table schedule
1.	English for Research Paper Writing	AC01	CMT	1st Lecture Thursday & Friday
2.	Disaster Management	AC02	ESE (Env Sc. and Engg.)	
3.	Value Education	AC04	Religious Studies	
4.	Stress Management by Yoga	AC07	Physiotherapy	

List of Audit Courses 2 (2nd Semester-Non Credit):

Sr. No.	Course	Code	To be Taught by Department	Time table schedule
1.	Sanskrit for Technical Knowledge	AC03	Religious Studies	1st Lecture Thursday & Friday
2.	Constitution of India	AC05	Faculty of Law	
3.	Pedagogy Studies	AC06	HRDC	
4.	Personality Development through Life Enlightenment Skills	AC08	Applied Psychology	

***List of Open Electives (3rd Semester - 3 Credits):**

Sr. No.	Course	Code	To be Taught by Department	Time table schedule
1.	Business Analytics	3OE01	MBA/HSB	1st Lecture Wednesday, Thursday & Friday
2.	Industrial Safety	3OE02	Mechanical Engineering	
3.	Operations Research	3OE03	MBA/HSB	
4.	Cost Management of Engineering Projects	3OE04	MBA/HSB	
5.	Composite Materials	3OE05	Mechanical Engineering	
6.	Waste to Energy	3OE06	ESE (Env.Sc. and Engg.)	
7.	Advancements in Communication System	3OE07	ECE	
8.	Introduction to Soft Computing Techniques	3OE08	CSE	
9.	Advanced Printing Technology	3OE09	Printing Technology	
10.	Computer Aided Design & Manufacturing	3OE10	Mechanical Engineering	
11.	Food Safety and Quality Assurance	3OE11	Food Technology	
12.	Basic Nanotechnology	3OE12	Bio and Nano Technology	
13.	MEMS & NEMS – Sensors & Devices	3OE13	Bio and Nano Technology	

***Note:** Student has to choose any one Open Elective out of above list other than offered by his own department.

(3-A)

GRAPHICS IN PRINTING & PACKAGING

General Course Information	
SEMESTER - I Course Code: **MTPT-701** Course Credit: 4 Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective: This course deals with broad overview of computer graphics which is helpful for Printing, Packaging, Publishing, & Silicon corporate arena. It will cater the pre-press sections of industrial sectors for in-depth assignments. Valuable inputs from industry would be incorporated from time to time.

Course Outcomes: -

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

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 – EncapsulatedPost-script 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:

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

PRINT AND PACKAGING MATERIAL & TESTING

General Course Information	
SEMESTER – I Course Code: **MTPT-702** Course Credit: 4 Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective

The objective of this course is to impart the knowledge of different conventional and non conventional printing and packaging materials used in the industry along with their identification and testing techniques with respect to quality control.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the various raw material and chemicals used in printing and packaging industry.	L1
CO 2	Describe the various plastics materials used and their properties in print and packaging applications.	L2
CO 3	Elaborating and experimenting different tests on printing and packaging substrates.	L3
CO 4	Examine the various ink testing methods.	H1
CO 5	Identification and analysis of substrates and ink related troubleshooting.	H2
CO 6	Forecasting and implications of new materials and processes for printing and packaging applications.	H3

UNIT -I

Study of materials for pre-press films used for image-setter, plates used for plate-setters, chemicals used for processing of plates, light sources used such as laser, UV etc. plating chemicals for gravure cylinders such as copper, chrome, nickel etc. plating tanks, plating calculations such as current density, plating time.

Non conventional and conventional Substrates used for printing and packaging – various stocks. Paper : glazed, coated and LWC.

UNIT -II

Plastics : Polyolefin's like low density polyethylene, linear low density polyethylene, high density polyethylene, metal locene, cast polypropylene, Bi-axially oriented polypropylene, pearlised BOPP, properties of polyolefin's and application, manufacturing processes for polyolefin's. Other plastic substrates such as polyamide, polystyrene, acryloni-tritebutadience styrene, polyethylene tera phthalate. Other film as Aluminum foils, metalized films etc. factors to be considered for selecting substrate for a package.

Identification of the materials for printing and packaging by burning and solubility.

UNIT -III

Testing of materials for printing and packaging tests on package such as tearing, bursting strength, puncture resistance, grammage, drop test, and mechanical strength tensile modulus of elasticity, ash content test, optical test, cob test, chemical tests etc.
Inks used for printing – solvent based, water based UV based, drying mechanism.

UNIT -IV

Tests on inks – Dispersion test, colour comparison by drawdown and printing, strength comparison
Ink-tack measurement, viscosity measurement by various viscocups such as Ford cup, Zahn cup etc.
Adhesion tests viscosity theory and rheology. Troubleshooting for inks and substrates.

Text & Reference Books:

1. Plastics in Packaging by A.S. Athyale Tata McGraw Hill Publication.
2. Plastics in Flexible Packaging by A.S. Athyale- Tata McGraw Hill Publications.
3. Printing inks by Ronald E Todd-Pira
4. Printing Ink Technology by E-A Apps- Leonard Hill Ltd.
5. Pulp and Paper by James P. Cesey- Inter science publication.

Course Articulation Matrix

Course Code: MTPT-702 Nomenclature: Printing and Packaging Material and Testing															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
Program Outcome (PO)													**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

NEWSPAPER AND MULTIMEDIA TECHNOLOGIES

General Course Information	
SEMESTER - I Course Code: **MTPT-703** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Outcomes: -

Sr. No.	**At the end of the semester, students will be able to :**	**RBT Level**
CO 1	Describe the latest technology in the field of newspaper and multimedia.	L1
CO 2	Summarize the skills of current multimedia and newspaper technology.	L2
CO 3	Use the skills and knowledge in newspaper & multimedia .	L3
CO 4	Distinguish different multimedia concepts & techniques and Newspaper designing.	H1
CO 5	Determine different parts of a newspaper in relation to design	H2

UNIT -I

Newspaper Management and Organization:- Meaning of Management, Importance Of Management in a Newspaper, Principles of Management, Managerial functions in a Newspaper Organization- Planning, Organization, Organizational Structure, Coordination, Motivation, Control, Decision-Making, Departmentalization.

Newspaper in India (An Overview):- Number of newspapers, Circulation, Press Council of India, Press Information Bureau, News Agencies- Press Trust of India, United News Of India, Non- Aligned News Agencies Pool, Other News Agencies.

UNIT -II

Editing for a Better Designed Newspaper: - Designing by Editing, Some tips for better editing and design, Think Graphics, Changing Attitude, Content Relevancy.

Newspaper Make-up*:*- Newspaper Designing, Design Approach, Newspaper form, Newspaper format, Design Elements, Page Make-up.

UNIT -III

Exploring the World of Multimedia*:* - What is Multimedia, Types of Multimedia Productions, The Development of Multimedia, Multimedia and Society.

The Internet and Multimedia*:* - How the Internet developed, connecting to the Internet, Navigating the Web, Searching the Web, Communicating via the Internet.

UNIT -IV

Text And Graphics*:*- Role of Text and Graphics in Multimedia, Working with text, Formatting text, Using fonts, Font selection guidelines, Computer Graphics Technology, Editing Graphics

Audio and Video*:* - Role of Audio and Video in Multimedia, Software and Hardware for Audio and Video.

Text & Reference Books:

1. News Paper Management in India by Gulab Kothari, Rajasthan Patrika, New Delhi.
2. Art and Print Production by N.N. Sarkar, Oxford University Press, New Delhi.
3. Contemporary News paper Design by Mario R. Garcia, Prentice Hall, Englewood Cliffs, New Jersey.
4. Introduction to Multimedia by Ana Weston Solomon, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

Course Articulation Matrix:

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

PRINT ENTREPRENUERSHIP

General Course Information	
SEMESTER – I Course Code: **MTPT-704** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective:-The purpose of this paper is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. In particular the paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the various terminologies on entrepreneurship development and entrepreneurial support systems.	L1
CO 2	Describe the various components of entrepreneurship.	L2
CO 3	Elaborating and identifying the need and requirement of market survey for introducing new business plan.	L3
CO 4	Examine the various steps to be followed for preparation of project report for new business entity and the importance women entrepreneurs.	H1
CO 5	Appraise the various environmental considerations to be adopted in printing industry	H2
CO 6	Critical analysis of status of printing industry in India and future prospects.	H3

UNIT-I

Entrepreneurship

Concept/ Meaning; Need; Competencies/ qualities of an entrepreneur

Entrepreneurial Support System

District Industry Centers (DICs); Commercial Banks; State Financial Corporations; Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for

Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions / organizations at State level.

UNIT-II

Market Survey and Opportunity Identification (Business Planning)

How to start a small scale industry; Procedures for registration of small scale industry; List of items reserved for exclusive manufacture in small scale industry; Assessment of demand and supply in potential areas of growth; Understanding business opportunity; Considerations in product selection; Data collection for setting up small ventures

Project Report Preparation

Preliminary Project Report; Techno-Economic feasibility report; Project Viability

Legal Aspects of Small Business

Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules.

Factory Act and Payment of Wages Act.

UNIT-III

Women Entrepreneurs

Main Problems of Low Women Entrepreneurship in India

Important Schemes for women Entrepreneurs

UNIT-IV

Environmental considerations

Concept of ecology and environment; Factors contributing to Air, Water, Noise pollution; Air, water and noise pollution standards and control; Personal Protection Equipment (PPEs) for safety at work places

Status of Printing Industry in India

Current scenario of printing industry in India

Case study on Indian printing industry

Text & Reference Books:

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publication, Panchukula (Haryana).
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, SatyaPrakashan, New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi
9. Principles of Management by Philip Kotler TEE Publication.

Course Articulation Matrix:

Course Code: MTPT- 704 Nomenclature: Print Entrepreneurship															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	Program Outcome (PO)												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

ADVANCED PRINT FINISHING TECHNIQUES

General Course Information	
SEMESTER - I Course Code: **MTPT-705** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective: The objective of this course is to impart knowledge on major finishing techniques and materials.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe concept of modern print finishing.	**L1**
CO 2	Explain various domains of advanced print finishing and applications.	**L2**
CO 3	Classify various print finishing materials for specific applications.	**L3**
CO 4	Identifying various types of print finishing machine for advanced specific applications.	**H1**
CO 5	Appraise about integrated approach of print finishing and converting for printing and packaging applications	**H2**
CO 6		**H3**

UNIT- I

Finishing Techniques and principles.

Adhesives used for finishing and packaging.

UNIT- II

Concept of CIP3, CIP4.

Lamination techniques and UV curing.

UNIT - III

Extrusion process and Co-extrusion techniques.

Plastic used in Packaging: Polyethylene (HDPE, LDPE, LLDPE, Others), Polypropylene, Polystyrene, Polyvinyl chloride, Polyethylene teraphthalate, Polyvinyl acetate, Polyvinyl alcohol, Ethylene vinyl alcohol etc.

UNIT - IV

Concept of Shrink and stretch packaging.

Various forms of pouches – tetra pack, octagonal bag-in-box for solid and liquids, packaging & packages for food products, microwave packaging, PET bottles for food packaging.

Text & Reference Books:

1. Ralph Lyman, Binding And Finishing, Printing Industries Pr, 1st Edition, (1 June 1993)
2. BD Mendiratta, Binding And Finishing, Asian Books Pvt. Ltd 1st Edition, (1 January 2015)
3. T. J. Tedesco, Binding Finishing Mailing, Printing Industries Pr; 2nd edition (30 March 2005)
4. A. G. Martin, Finishing Process in Printing, London: Focal Press, 8th Edition, (1972).

Course Articulation Matrix:

Course Code: MTPT-705 Nomenclature: ADVANCED PRINT FINISHING TECHNIQUES															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	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	2	2	3	2	1
CO2	3	2	2	1	1	--	--	--	--	1	2	2	3	2	1
CO3	3	2	2	1	1	--	--	1	--	1	2	3	3	2	1
CO4	2	3	2	2	1	--	--	--	--	1	2	3	3	2	1
CO5	3	2	3	1	1	--	--	1	--	1	2	3	3	2	1
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

DIGITAL WORKFLOW LAB

General Course Information	
SEMESTER - I Course Code: **MTPT-706** Course Credit: 3 Contact Hours: 6 Mode: Practical Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** **Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** Internal practical evaluation is to be done by the course co-ordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the various applications of computers in different printing technologies.	L1
CO 2	Describe the 3D printing workflow and its importance.	L2
CO 3	Experimenting colour management systems and the various softwares involved.	L3
CO 4	Critical analysis of digital workflow and its implication in printing industry.	H1
CO 5	Identification of various print production systems and dynamics involved in it.	H2
CO 6	Listing down various strategies involved in print production with digital workflows	H3

List of Experiments -

1. Study of Computer to Technologies: Computer to Film, Computer to Plate, Computer to Press and Computer to Print.
2. Study of Digital Workflow Software's. For Example- Prinect, Creo, Esko, Torflex, Prinergy,Total flow solutions, etc.
3. Study of 3-D Printing Workflows.
4. Study of Color Management Software
5. Machines, Equipments and Components used in Digital Workflows.
6. Print Production Via Digital Workflows-:
    a. Total Flow Capture- Composition, Variable Data Printing
    b. Total Flow Manage- Mail Preparation, Make Ready, Print MIS/ Transforms, Prepress, Output Management.
    c. Total Flow Produce- Color Manage, Print Manage Workflow

Course Articulation Matrix

Course Code: MTPT-706 Nomenclature: Digital Workflow Lab															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	Program Outcome (PO)												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

MODERN PRINTING SYSTEMS

General Course Information	
SEMESTER - II Course Code: **MTPT-711** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective: This course deals with broad overview of printing systems which is helpful for Printing & Packaging fields. It will cater the different sections of industrial sectors for in-depth assignments. Valuable inputs from industry would be incorporated from time to time.

Course Outcomes -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To define various advanced printing processes and their utilities.	L1
CO 2	To describeadvancements in printing domains.	L2
CO 3	To interpret automation in conventional printing machines	L3
CO 4	To distinguish various modern printing technologies	H1
CO 5	To evaluate the significance of advanced printing systems	H2

UNIT – I

Computer aided offset presses, PEC, PEM, PECOM, CIP3, CIP4 Technology.
Drive systems for offset presses, pneumatics, hydraulics, common shafts and shaft-less.
Hi-Fi color printing.
Automatic plate mounting systems for offset presses.
Driography process, Security Printing, Non Impact Process.
Trouble shooting in offset presses.
Other printing processes like Pad printing, screen printing, heat transfer, tampon printing.

UNIT - II

Digital and customized printing.
DI Presses
Understanding press functions and how they are controlled.
Image carriers for gravure- functions, variables in plating, hardness, calculation.
Integrated Gravure Pre-press-direct to gravure, electronic engraving, fast cross feed, twin mode, sequential engraving, shrink compensation, automation in engraving like Hello Robot, Laser beam and electronic Beam approach, Dot generation for gravure, cylinder correction techniques like burnishing, re-etching, cell size by electronic engraving, environmental and safety consideration, cylinder proofing machines.

UNIT - III

Doctor Blades - Purpose, focus on doctor blade, pressurization system, oscillation mechanism, chrome fracturing density, wear mechanism, manufacturing, Lamella, mounting and set up storage, problems quality control and inspection of doctor blades.

Continuous flow inking system, impression roller pressure, sleeve systems, electrostatic assisted ink transfer, structure of impression roller for ESA, conductivity, cooling mechanism.

Drives the Gravure and Flexo Electronic line shat mechanism pneumatics and hydraulics used in gravure and Flexo.

UNIT - IV

Mounting system for flexo- Pin register mounting, microdot technology, video mounting, sleeve mounting, Newflexo approaches – Cyrel, Dig sleeve, Anilox Roller, Structure, Cell structure and cell making.

Press environment logistics- Handling systems, waste disposal, exhaust at purification, cleaning systems, pressure climate, requirements, machine maintenance and Care.

Digital Printing – Integration for Packaging application – such as label.

Hybrid systems such as Gravure – Flexo, Offset, Gravure etc.

Text & Reference Books:

1. On demand printing by Havoed M Fenton Frank J. Romao, 1st edition, 1998
2. Developments in Web Offset by Bob Durrant.
3. Comparative guide to direct – to – press technology. 2nd edition-1999, By Molly J. Joss.
4. Gravure process and technology – Gravure Education foundation- Gravure Association of America.
5. Flexography 2nd Edition – Pira Visual Aid.
6. Modern Gravure Technology by Harry B. Smith – Pira International.
7. Advancements in Printing Plate Technology by Steve Doyle – Pira International.
8. High Quality Flexography by Tony White – Pira International.

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

DIGITAL IMAGING TECHNIQUES

General Course Information	
SEMESTER - II Course Code: **MTPT-712** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective:

The aim of this subject is to explore knowledge about Digital Images, Colour and Colour Management in digital printing.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the various digital file formats for print production images.	L1
CO 2	Describe and listing down the input devices and their specific characteristics.	L2
CO 3	Analysis of digital colour separation methods and their applications.	L3
CO 4	Critical analysis of colour profiles, colour management softwares and colour vision testing.	H1
CO 5	Identification of 3Cs of colour management and their importance on print quality.	H2
CO 6	Transforming print quality through various innovative techniques and processes	H3

UNIT-I

Images and Types of Images (colour originals), Different formats used in Print production for Images (TIFF, EPS, PNG, JPEG, PDF, GIF,) Anatomy of a Digital Image.

UNIT-II

Different types of input devices: Digital camera, Copy Dot scanner, advanced scanning techniques (Scanner resolution and file size, Sharpness, Tone Adjustment, Colour Adjustment, Automatic Colour adjustment), Preparing originals for scanning, Scanner workflow. Advanced image editing softwares,

Digital representation and Manipulation of images, Digital Colour Separation used by Advanced DTP softwares, Electronics imposition techniques and softwares.

UNIT-III

Colour profiles, colour models, colour matching, colour measuring, Profile standards, colour vision testing, colour calibration techniques, colour management softwares (CMS), colour visualization and analysis, contact proofing closed loop and open loop system, Colour, communication with customers, printing specification. Three Cs of colour management – scanner calibration and characterization, Monitor calibration and characterization, printer calibration and characterization, system level colour management solutions, features and ease of use, Profiling softwares

UNIT-IV

Different types of Lasers used in imaging, workflow for imaging and processing techniques, Plate setters. Networking and Electronic Publishing

Text & Reference Books:

1. Understanding Digital Colours by Phil Green- GATF publication- 1999.
2. Colour Management, 2nd edition, 1998.
3. Mastering Digital Printing 2nd Edition by Harald Johnson – Thomson publication
4. Digital Imaging by Joe Farace – Focal Press – 1998
5. The Digital Printing Handbook by Tim Daly – Argentum- 2002
6. A guide to Graphic Print Production 3rd edition by Kaj Johansson, Peter Lundberg, Robert Ryberg- John Wiley & Sons. Inc – 2011

Course Articulation Matrix

Course Code: MTPT-712 Nomenclature: Digital Imaging Techniques															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
Program Outcome (PO)													PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

ADVANCED QUALITY CONTROL AND INSTRUMENTATION

General Course Information	
SEMESTER - II Course Code: **MTPT-713** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective : The course is intended to impart in-depth knowledge to various quality control parameters used in printing and to provide thorough coverage to advanced quality control instrumentation and standardization in field of printing technology.

Course Outcomes: -

Sr. No.	**At the end of the semester, students will be able:**	**RBT Level**
CO 1	To list various definitions of quality, control, quality control and quality assurance.	L1
CO 2	To describe various quality terminologies used in print industries.	L2
CO 3	To demonstrate principles of ISO and other printing standards.	L3
CO 4	To examine various quality control attributes being used for checking print quality.	H1
CO 5	To evaluate print quality with the help of related instruments.	H2

UNIT-I

Quality Control Definition, Objectives, Inspection, Quality Assurance, PAF model of quality costs.

Quality control in

a) Prepress

b) Press

c) Post Press

UNIT-II

Understanding UGRA, FOGRA, BIS, ISO 12647, GRACOL, SWOP standards.

Quality control patches, Color control bar, Understanding mottle, Star target, Slur bar.

UNIT-III

Densitometry, Ink film thickness, Solid ink density, Dot gain, Print contrast, Hue error, Grayness, Ink trapping.

Color and color difference measurement, Tristimulus colorimeter, Spectrophotometer, Color space, Spectral reflectance curves, Color Profiles, 3 C of Color Management.

UNIT-IV

Statistical Process Control, Statistical Quality Control, 6 Sigma, Just in time, Quality circle, Quality function deployment.

Implementing ISO 9000, ISO 14000 and Total Quality Management Practices.

Text & Reference Books:

1. Bob Thomption, Printing Material and Science.
2. Miles Southworth and Donna Southworth. Quality and Productivity in the Graphic Arts Publishing Company(1980)
3. Kelvin Tritton, Colour Control for Lithography, PIRA International.
4. Mortimer, AColour Reproduction in Printing Industry PIRA International.
5. Phil Green Quality Control for Print Buyers, Blue Print
6. H.L Apfelberg and M.J. Apfleberg, Implementing Quality Management in Graphic Arts, GATF.

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	1	1	2	1	-	-	1	-	1	1	3	2	1
CO2	3	1	1	2	2	1	-	-	1	-	-	1	2	21	1
CO3	2	2	-	2	3	2	-	-	2	-	-	1	2	2	1
CO4	2	2	1	2	3	1	-	-	2	-	-	2	3	2	1
CO5	2	1	1	2	2	1	-	-	1	-	-	3	2	2	1

PRINT TECHNOLOGY MANAGEMENT

.

General Course Information	
SEMESTER - II Course Code: **MTPT-714** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective: The various perspectives of business strategy, innovation, intellect phenomenon; and productivity are being stressed upon. Forecasting is utmost important for any venture; and students are to carry with some case studies and practical past experiences/examples. Students would also interact with industry personnel for getting into latest modules.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	To list the various strategies meant for technology management.	L1
CO 2	To explain the forecasting modules in the present context.	L2
CO 3	To apply the various domains of intellectual property rights.	L3
CO 4	To examine the utility of Just-in-Time in Printing technology fields	H1
CO 5	To analyse R&D and managerial productivity domains.	H2

UNIT – I

Introduction to Technology Management.Business Strategy for New Technologies.

Technology Forecasting - Techniques of Forecasting, Technology, Forecasting-Relevance, Strategic alliance and Practicality and Technology transfer.

UNIT - II

Management of Research, Development and Innovation – Technology mapping, Comparison of types of R & D project and development approaches- radical platform and Incremental projects, innovation process. Management Roles and Skills for New Technology

UNIT - III

Management of Intellectual Property Rights - Strategic value of patents, trade secrets and licensing. Managing Scientists and Technologists - Identification, Recruitment, Retention, Team work and Result orientation.

UNIT – IV

Technology for Managerial Productivity and Effectiveness - Just-in-Time

Venture Capital & Technology Development

Practical Tasks -
- Technology forecasting and Technology Mapping
- Technology Strategy Development
- Exercise on Just-in-Time
- Case on Venture Capital

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Text & Reference Books:

1. Technology and Management by Cassell Educational Ltd. London
2. Management of High Technology Research and Development by John Humbleton Elsevier
3. Strategic Management by Charles W.L. Hill/Gareth R. Jones, Houghton Miffin Co.
4. R & D Management by S.A. Bergn, Basil Basil Blackwell Inc.
5. Innovation and Entrepreneurship InOrganisations by Richard M. Burton &BiregeObel Elsevier
6. The Bank book of Forecasting- A Management Guide by Spyros Maksidakis& Steven C Wheelwright, John Wiley & Sons
7. New Product Management by C. Marle Crawford IRWIN, USA.
8. Just in Time by David Hutchin, Gower Technical Press

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

MODERN SECURITY PRINTING

General Course Information	
SEMESTER - II Course Code: **MTPT-715** Course Credit: 4	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Objective-

This course aims to cover advance knowledge of different types of security printing features and methods being used in printing of Currency and other secured documents along with their practical applications in modern time.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Describe types of modern security printing products, processes and special applications.	L1
CO 2	Explain currency printing and educational documents with modern security features.	L2
CO 3	Apply modern security features in negotiable instruments and office documents.	L3
CO 4	Differentiate modern security features for identification of original and fake products/documents	H1
CO 5	Determine list of security features and their specific use in printing, packaging and allied fields for long term solutions.	H2

UNIT-I

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

Currency Printing :- Introduction to Currency Printing, Incorporation of Security features in currency, Design concepts for currency, Secret Patterns, Watermarks, Fine line Printing, Micro Printing, Identification standards, Secret Patterns, etc.

UNIT-II

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.

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

UNIT-III

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.

Modern Security Techniques: - RFID, Bar-coding, Holography, Foils, High-resolution borders, Micro printing.

UNIT-IV

Security Inks and Substrates:- Metallic inks, Florescent Inks, OVI, Non-convention substrates : -Non tear able paper, plastic. Watermark, Security threads.

Educational Certificates: - Security features for Degree, DMC and other secured documents of Universities and educational institutes.

Text & Reference Books:

1. Gerardus Blokdyk, Security printing The Ultimate Step-By-Step Guide Paperback, April 2018
2. Richard D. Warner, Richard M. Adams by "Introduction To Security Printing Paperback – Import", July 2005
3. Adams and Foux, Printing Technology, Delmar Cengage Learning, 2005.
4. Kipphan Helmut, "Hand Book of Print Media", Springer, Germany, 2001.

Course Articulation Matrix:

Course Code: MTPT-715 Nomenclature: MODERN SECURITY PRINTING															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	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	2	1
CO2	3	3	1	1	1	-	-	1	-	-	-	1	3	2	1
CO3	3	3	2	1	3	1	-	2	1	2	2	2	3	2	1
CO4	3	3	3	3	2	1	1	2	2	2	2	2	3	2	1
CO5	3	2	1	2	1	1	-	1	1	2	1	3	3	2	1
CO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Printing Machine Maintenance Lab

General Course Information	
SEMESTER - II Course Code: MTPT - 716 Course Credit: 3 Contact Hours: 6 Mode: Practical Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** **Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe Digital Printing Pre press work Flow	L1
CO 2	Explain working of narrow & large format digital presses	L2
CO 3	Use Digital Printing Technologies	L3
CO 4	Compare Various types of maintenances of printing machines.	H1
CO 5	Grade Measure Different Printing Processes and their maintenance	H2

List of Experiments:-

1. Study of different advanced printing processes.
2. Study and observations of different drive systems used in high speed printing machines.
3. Study of working of narrow & large format digital presses.
4. Study of various types of maintenances of printing machines.
5. Study of typical Break Down of printing machines.
6. Study of Mechanical and Electrical Elements like Bearings, Cams and Follower, Springs, Electrical Elements.
7. Study of Maintenance of Mechanisms like Electrical Maintenance, Pneumatic System Maintenance, Hydraulic System Maintenance, Mechatronics.

8. Study of maintenance of Power Transmission devices such as Chain Drives, Belt Drives, Gear Drives, Maintenance and Lubrication of Drive Systems, Direct drive technology

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

MAINTENANCE MANAGEMENT

General Course Information	
SEMESTER - III Course Code: **MTPT-721(A)** Course Credit: 4.0	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 4 Mode: Lectures and Tutorials Examination Duration: 3 Hours	For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.

Course Outcomes: -

Sr. No.	**At the end of the semester, students will be able to :**	**RBT Level**
CO 1	Describe the maintenance management techniques used in printing organizations.	L1
CO 2	Summarize the effective maintenance and fault rectification plans for printing and packaging industries.	L2
CO 3	Generalize various types of maintenances of printing machines.	L3
CO 4	Distinguish different printing processes and their maintenance	H1
CO 5	Determine different various print machine maintenance management concepts	H2

UNIT -I

Reliability: Hazard rate, mean time to failure. Hazards models. Constant hazard Weibul model. System Reliability: Series, parallel and mixed configurations. K-out-of-n structure. Economics of introducing a stand by or redundancy into a production system, optimum design configuration of a series/parallel system: maximizing reliability subject to budgetary constraint optimum level of active parallel redundancy for equipment with components subject to failure.

UNIT -II

Maintainability: Maintainability increment Equipment and mission availability. Replacement Decisions: Economic models block replacement policy, age replacement policy, replacement policies to minimize downtime, economics of preventive maintenance. Inspection Decisions: Optimal inspection frequency to profit maximizing, minimization of downtime and availability maximization. Overhaul and Repair

UNIT -III

Decisions:

Optimal overhaul/repair/replace maintenance policies for equipment subject to breakdown finite and infinite time horizon optimal repair effort of a maintenance work force to meet fluctuating taking into subcontracting opportunities Spares

UNIT -IV

Provisioning :

Spares provisioning for single and multiechelon systems under budgetary constraints. Maintenance Organization: Computer application in maintenance management, MIS for maintenance.

Rectification of Faults:

Identification and rectification of faults, maintaining different types of Image setters, CTP, Digital and other Printing Machines.

Text & Reference Books:

1. “Maintenance Engineering and Management”, By K. Venkataraman
2. “The Handbook of Maintenance Management”, By Joel Levitt
3. “Maintenance Engineering and Management”, By Dr. Subhash Chandra
4. “Production and Operation Management”, By Aswathappa&ShridharBhat

Course Articulation Matrix:

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

MODERN PACKAGING TECHNOLOGY

<table>
<tr><td colspan="2">General Course Information</td></tr>
<tr><td rowspan="2">SEMESTER - III

Course Code: MTPT-721 (B)

Course Credit: 4

Contact Hours: 4

Mode: Lectures and Tutorials

Examination Duration: 3 Hours</td><td>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.</td></tr>
<tr><td>For the end semester examination, a total of nine questions are required to be set by the examiner. Question No. 1 will be compulsory and will be having seven parts covering the whole syllabus. Other eight questions will be from the 4 Units covering two questions from each Unit. A candidate is required to attempt question No. 1 which is compulsory and other 4 questions, one each from each Unit. All questions carry equal marks.</td></tr>
</table>

Course Objective

This course aims to cover advance knowledge of different types of packaging commercially being used along with their innovative practical implementations.

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 various types.	**L1**
CO 2	Explain various domains of Packaging in different arena.	**L2**
CO 3	Classify various Packaging materials for specific applications.	**L3**
CO 4	Identifying various types of Packaging machine for different applications.	**H1**
CO 5	Appraise different rules, laws & regulations at National & International level regarding, Legal, and Environment aspects.	**H2**

UNIT-I

Introduction to packaging, Functions, MAP, CAP, Smart and Intelligent Packaging, Ecological Aspects, 5 R- Reduce, Reuse, Recycle, Recover, Replenish, Green Packaging for Homes and Offices, Innovative trends in Package Design.

Cellulosic Materials, Processes in Cellulose Industries, Paper and Board Manufacture, Testing of Cellulose and Paper Materials, Specialty Papers, Folding Cartons, Multiwall Paper Sacks, Composite Containers.

UNIT-II

Fiber board Cartons, Drugs, Glass Containers: Manufacture, Properties, Applications.

Polymer Chemistry, Classification of Polymers, Properties, Processing of Plastics, Special Plastics and Their applications, Seals, Coatings, Laminates, Adhesives, Reinforcements

UNIT-III

Cushioning Mechanism, Fragility Assessment, Cushion Design, Testing, Wooden Containers, Textile bags, Containerization and Cargo Marking. Gravure Printing Process; Characteristics, role, importance and applications.

Introduction to Design of Moulds and Tooling: Injection Moulds, Blow Moulds, Extrusion dies, Product Design.

UNIT-IV

Filling of Dry and Liquid Products, Filling of Carbonated Liquids and other Packaging Techniques, Cartooning, Labeling, Thermoforming.

Loss Prevention, Weights and Measures Act/ Packaged Commodities Act, Eco Regulations, Recyclability of Packaging Media and Technologies, Pollution Control, FPO, PFA, FDA, Rules and Regulations.

Text & Reference Books:

1. Walter Saroka, Hand Book of Packaging Technology, Institute of Packaging Professionals,4th Edition, 2009
2. Joseph F. Hanlon, Robert J. Kelsey, and Hallie Forcinio, "Hand book of Package Engineering", CRC press, 3rd Edition, 1998
3. Kit L Yam, The Wiley, Encyclopedia of Packaging Technology, John Wiley & Sons Inc. Publication, 2009
4. Anne Emblem and Henry Emblem; Packaging Technology – Fundamentals, materials and processes, Wood head Publishing, 2012

Course Articulation Matrix:

Course Code: MTPT-721 (B) Nomenclature: MODERN PACKAGING TECHNOLOGY															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	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	2	2	3	2	1
CO2	3	2	2	1	1	--	1	--	--	1	2	2	3	2	1
CO3	3	2	2	1	1	--	1	1	--	1	2	3	3	2	1
CO4	2	3	2	2	1	--	--	--	--	1	2	3	3	2	1
CO5	3	2	3	1	1	1	2	1	--	1	2	3	3	2	1
CO6	--	--	--		--	--	--	--	--	--	--	--	--	--	--

MAJOR PROJECT (PART-I)

General Course Information	
SEMESTER – III Course Code: **MTPT-722** Course Credit: 5 Contact Hours: 6 Mode: Lecture, Tutorial and Practical Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal evaluation is to be done by the supervisor/Guide. The end semester presentation and viva-voc examination will be conducted by a three member committee including supervisor.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the process of carrying out research in printing.	L1
CO 2	Describe the process of literature review for research work.	L2
CO 3	Identifying the potential areas for research topics in printing.	L3
CO 4	Examine the various processes and steps involved in formulating the research problem.	H1
CO 5	Drawing the layout plan for research process and designing the course of action to be followed.	H2
CO 6	Critical analysis of the present status of printing industry.	H3

The topic of the Project will be decided under the guidance of concerned project guide & major dissertation will be produced in part II.

Course Articulation Matrix:

Course Code: MTPT- 722 Nomenclature: Major Project (part- I)															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	Program Outcome (PO)												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

PRINT & PACKAGING QUALITY CONTROL LAB

General Course Information	
SEMESTER – III Course Code: **MTPT-723** Course Credit: 3 Contact Hours:6 Mode: Practical Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** **Course Assessment Methods; Max. Marks: 100 (Internal: 50; External: 50)** Internal practical evaluation is to be done by the course coordinator. The end semester practical examinations will be conducted jointly by external and internal examiners.

Course Outcomes: -

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

List of Experiments

1. Study of characteristics of substrates (Hygroscopic and Non-hygroscopic) for all major Printing Processes.
2. Study of tests performed on Paper, Card, and Board for all printing purpose.
3. Study tests performed on Paper, Card, and Board for packaging purpose.
4. Study of tests performed on Non-paper substrates for packaging purpose.
5. Study of Testing of flexible packages and their standards.
6. Study of Testing of rigid packages and their standards.
7. Study of characteristics, requirements and standards of printing inks for all major Printing Processes.
8. Study of various ISO standards related with all major printing processes for Quality Control.
9. Study of various Quality control standard bodies related with printing and graphic communication in India, Europe and USA.

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	1	1	2	1	-	-	1	-	1	1	3	2	1
CO2	3	1	1	2	2	1	-	-	1	-	-	1	2	21	1
CO3	2	2	-	2	3	2	-	-	2	-	-	1	2	2	1
CO4	2	2	1	2	3	1	-	-	2	-	-	2	3	2	1
CO5	2	1	1	2	2	1	-	-	1	-	-	3	2	2	1

MTPT-731 MAJOR PROJECT (PART-II)

General Course Information	
SEMESTER – IV Course Code: **MTPT-731** Course Credit: 9 Contact Hours: 12 Mode: Lectures, Tutorials and Practical Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** **Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Internal evaluation is to be done by the supervisor/guide. The end semester presentation and viva-voice examination will be conducted jointly by external and internal examiners.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	Define the various reviews of literature techniques and importance in research.	L1
CO 2	Describe the experimental work to support the research.	L2
CO 3	Elaborating the role and importance of data collection and data analysis in research.	L3
CO 4	Comparing the different methods and ways of using tools for data analysis.	H1
CO 5	Presentation of results and discussion for research work	H2
CO 6	Critical analysis of current status of printing industry in India and future forecast.	H3

The Project will be under the guidance of concerned project guide & major dissertation will be produced here.

Course Articulation Matrix:

Course Code: MTPT- 731 Nomenclature: Major Project (part-II)															
1: Slight /Low 2: Moderate/Medium 3: Substantial/High															
	Program Outcome (PO)												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	2	2	1	--	--	2	--	--	2	3	3	1
CO2	3	1	2	1	1	--	--	--	--	--	--	3	2	3	1
CO3	3	2	1	--	2	--	--	--	--	--	--	3	3	3	1
CO4	2	2	2	3	1	2	--	--	3	--	--	2	3	2	2
CO5	2	2	1	--	2	--	--	--	--	--	--	2	3	3	1
CO6	2	2	3	2	--	3	--	--	-1	--	--	2	--	1	2

Advanced Printing Technology

General Course Information	
Open Elective Course offered to other Department Students (Semester-III) Course Code: 3OE09 Course Credit: 3(Open Elective) Contact Hours: 3hrs/week, (L-T-P:3-0-0) Mode: Lectures and Tutorials Examination Duration: 3 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Outcomes: -

Sr. No.	At the end of the semester, students will be able to :	RBT Level
CO 1	Describe Digital Printing Pre press work Flow	L1
CO 2	Explain Non-Impact Printing Technologies	L2
CO 3	Use Digital Printing Technologies	L3
CO 4	Compare Various Advance Printing Technologies	H1
CO 5	Grade Measure Different Printing Processes	H2

UNIT-I

Digital Printing Technologies

Digital printing – Definition, Scope and job suitability of Digital printing process. Computer-to-Press – Working principle of Direct Imaging with once image able master and Working principle of Direct Imaging with re-image able master. Computer-to-Print – Working principle.

UNIT-II

Non-Impact Printing Technologies

Principle of Non-impact printing technology, Flow chart of NIP technology and Applications of NIP technology. Principle of Electrophotography – Imaging, Inking, Toner transfer, Toner fixing and Cleaning. Working principle of thermal transfer and thermal sublimation printing systems. Principle of Ink jet printing - Continuous ink jet and Drop-on-

demand ink jet.

UNIT-III

Special Printing Technologies

Principles of hybrid printing system and Application of Hybrid printing systems, Principles of holograms making process, Components of hologram making system - laser, lenses, beam splitter, mirrors, holographic film and Process steps of hologram making system, Principles of Hi-Fi printing process

UNIT-IV

Emerging Printing Process

Principles of E-book, Principles of E-paper, Types of display of E-paper, Application of E-paper, Concepts of rewritable paper, Imaging and erasing processes for rewritable paper. Introduction about 3D printing, Steps involved in 3D printing process and Application of 3D printing.

Text & Reference Books:

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

Course Articulation Matrix:

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