



B.Tech (Printing, Graphics & Packaging)

Syllabus

Duration: Four year

Eligibility: 10+2 with non-medical or medical stream

w.e.f. Academic Session: 2014-2015

Institute of Mass Communication and Media Technology

Kurukshetra University

SCHEME OF STUDIES & EXAMINATIONS
**B. Tech. (Printing, Graphic & Packaging)
 VII Semester**

Course No.	Course Title	Exam. Marks				Time
		Internal Assessment	Theory	Practical	Total Marks	
701	PRINT AND PACKAGE MANAGEMENT	25	75		100	3 Hrs
702	PRINTING PLANT LAYOUT	25	75		100	3 Hrs
703	GRAVURE TECHNOLOGY	25	75		100	3 Hrs
704	PRINTING INK TECHNOLOGY	25	75		100	3 Hrs
705	PRINT FINISHING	25	75		100	3 Hrs
706	QUALITY CONTROL IN PRINTING AND PACKAGING	25	75		100	3 Hrs
	LAB					
711	GRAVURE TECHNOLOGY-LAB	25		50	75	3 Hrs
712	PRINTING INK TECHNOLOGY-LAB	25		50	75	3 Hrs
713	PRINT FINISHING-LAB	25		50	75	3 Hrs
714	QUALITY CONTROL IN PRINTING AND PACKAGING-LAB	25		50	75	3 Hrs
770	MINOR-PROJECT	Student has to submit a project report on a assigned work by his/her concerned teacher & the report will be evaluate by the examiner appointed by Director/Chairperson			50	
	TOTAL				950	

701
PRINT & PACKAGE MANAGEMENT

Time : 3 hours

Max. Marks: 100
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I

Business Environment – Printing Industry in India & Abroad. Impact of globalization & IT. Management – Nature scope and importance of Management, Functions of Management –Scientific, Management, CPM & PERT (Introduction)

UNIT-II

Production and operations Management – Locations and Layout of plant, Maintenance management. Quality assurance, Total quality management (TQM), ISO. Marketing management – Marketing and its functions, distribution channels, salesmanship and advertising.

UNIT-III

Human resource management: Manpower planning – recruitment, selection, Training performance appraisal Wage and salary administration.
Financial Management, Nature, Scope objectives and functions of Financial Management.

UNIT-IV

Work flow and organizational structure in a printing press.
Cost Accounting: Cost concept, cost sheet, B.E.P.analysis, cost reduction and cost control.
Depreciation - Introduction to different methodes and their comparison.

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. Balaraman – PMCA by Ramaya Features & publications, 1987.
4. Mendiratta B.D. – Estimating & Costing by Print Trade Publications, 1999-2000.
5. Ruggles – Printing Estimating Principles and Practices by Delmer Publication 1985.
 - (a.) Maintenance Engineering Handbook
 - (b.) Lindley R. Higging, Mc Graw Hill International Edition.
 - (c.) Operator’s Manually by GATF.
6. R.D. Aggarwal-Organisation and Management-Tata McGraw Hill Publishing Ltd., New Delhi

702
PRINTING PLANT LAYOUT

Time : 3 hours

Max. Marks: 100
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I

Site Selection:

Strategic issues of location. The supply-distribution system, Dynamic nature of plant 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-II

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

UNIT-III

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:

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

UNIT-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 :

Facility layout and location-Richard L.Francis, John A. White. Computer Aided Production Management - Mahapatra

Production and Operations Management - Mchelmann Oakland, Lockyer

Practical Plant Layout - Herold B.Maynard

Industrial Engineering Management System- Dr. S. Dalela, Dr. Mansoor Ali

Industrial Engineering & Management - O. P. Khanna

Industrial Engineering and Production Management-M. Mahajan.

Materials handling for Printer - A. John Geis, Paul L. Addy.

703
GRAVURE TECHNOLOGY

Time : 3 hours

Max. Marks: 100
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I

Gravure:

History of gravure, Gravure products and markets - Publication gravure - gravure packaging and converting - product gravure. Gravure Screens. Gravure cylinder preparation - Diffusion etch - Direct Transfer-Electromechanical process - Laser cutting. Electronic engraving systems today. Chemical engraving methods and equipments – cell configurations-advantages and disadvantages. Cylinder correction methods - Re-etching electro mechanical engravings, Colour balance etches, spot plating. Well formation - variables, basic types. Cylinder construction and preparation - Cylinder design, types. Balancing the cylinder. Copper plating and polishing, Reuse of cylinders.

UNIT-II

Gravure Doctor blade assembly –

Blade angles. Blade distance from Nip, Blade edge, Blade mounting. Doctor Blade wear - Fatigue, Corrosion, Abrasive, Adhesive wear, Doctor blade materials, Doctor blade Holder configurations, Blade setting procedures, Preparing blade for use, Doctor blade problems. Gravure Impression Roller - function, Roller covering, Roller pressure, Cylinder diameter, Roller design & configuration. Balance-static & Dynamic. Roller setting. New developments. Storage of impression rollers. Impression roller problems. Impression mechanisms mechanical, Hydraulic, Pneumatic.

UNIT-III

Gravure Press and Its components:

A generic printing unit. Sleeve & solid cylinder, single and two revolution, sheet fed and web fed machines, Typical press configurations. Gravure publication press-characteristics. Packaging Gravure Press - Folding carton Press. Flexible Packaging press, Label press. Product gravure. Other gravure press - Intaglio plate printing, offset gravure and flexogravure. Gravure with flexo units. Gravure units as other equipment. Gravure roller coating. Gravure folders - types. Gravure Ink Dryers - Need for ink dryers, Drying water based inks, Dryers functioning, Dryer limitations, supply air valves, balancing the dryer, filters & dampers, roller condition vital. Heat Sources - steam, electric and gas, combination gas/oil, thermic oil, waste heat form incinerators. Solvent Recovery Methods. Gravure cylinder preparation- basic construction, surface finishing, sleeve and integral shafting of cylinder, Electro-mechanical, electron beam & Laser engraving.

UNIT-IV

Gravure Substrates:

Paper substrates-Roto news papers, Coated papers, Gravure packaging paper substrates - properties. Label stock, Paper board. Non Paper substrates - surface preparation, plastics-properties. Metalized films - Aluminium foil, Foil laminations. Gravure advantages, limitations. Future of Gravure Printing Industry.

Recommended Books :

Gravure process and technology - GAA.
Printing Technology - Adams, Faux, Rieber.

704
PRINTING INK TECHNOLOGY

Time : 3 hours

Max. Marks: 100
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I

Printing Inks

Introduction, solvent based inks, water based ink, ingredients in Ink- pigments- properties, types, carbon black, inorganic pigments, organic pigments, physical characteristics of organic pigments. Vehicles for liquid inks, vehicles for paste inks, UV curing vehicles. Additives - driers, extenders, anti oxidants, waxes. Oils- vegetable drying oils, semi drying oils, non drying oils. Drying mechanisms - physical drying mechanisms, absorption drying, evaporation drying, chemical drying systems, oxidation polymerization drying, radiation drying and curing, microwave drying, infrared drying. 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. Optical properties of ink films, rheology and ink transfer requirements, ink distribution and transfer on the press, method for the direct measurement of ink setting on coated paper.

UNIT-II

Printing Ink manufacturing machines & equipments

Paste inks - single roll mill, twin roll mill, triple roll mill, ball mill, twin horizontal mixer, uni-roll mill, high speed stirrer milling. Liquid inks - ball mill, pearl mill, sand mill, bead mill, shot mill. Trends and developments in ink manufacturing process.

UNIT-III

Radiation curing

Introduction, radiation curing inks, ink cure considerations, chemistry of uv curing-photo initiation, propagation, termination. Cationic curing, electron beam curing

UNIT-IV

Security Inks

Range of security inks, special security features - fluorescence, phosphorescence, reflected by improved filters, magnetism, security printing inks for cheques-penetrating L/p inks, water fugetive inks, inks reacting with pen evadicators, red-ox reagents, inks reacting with solvents, invisible reactive inks, carbonizing inks. Security inks conformity tests and Q.C.tests-tests for chemical resistance, light fastness, rub resistance test, crumpling resistance test, grinding control, colour control, control of the rheological properties, control of drying time, control of various specific properties. Environmental considerations in security printing.

Recommended Books :-

Printing materials science & technology - Bob Thompson-PIRA
Advances in printing science & technology Vol.24 - J. Anthony Bristow
Hand book of Print & Production - Micheal Barnard, John Peacock
Introduction to Printing Technology - Hugh M.Speirs. SIGPA - 1987

705
PRINT FINISHING

Time : 3 hours

Max. Marks: 100
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I

Introduction:

Bindery in The New Millennium, Latest Developments in Print Finishing. Organization and Workshop Layout. Importance of Book Binding. Growth Factors in Print Finishing. Book Binding Tools- Forwarding Tools, Finishing Tools. Binding Room Equipments- Laying Press, Standing Press, Sewing Frame, Glue Pot, Board Cutting. Book Binders Materials & Quality Control. British Standard Paper Sizes. International Paper Sizes. Ra & Sra Sizes. Advantages of ISO Paper Sizes. 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 Material.

UNIT-II

Structure Of A Book:

Physical Parts of a Hard Bound Book. Operations of Ideal full Cloth Binding Production-Pre-Forwarding Operations, Forwarding Operations, Finishing Operations. Jogging, Counting, Cutting, Slitting, Trimming. Folding Binders Aids, Characteristics of Printed Sheet, Planning Imposition, Folding Schemes. Hand Folding- Folding To Paper, Folding To Print, Lump Folding, Puckering, Advantages & Limitations Of Hand Folding. 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, Collating - Collating Marks. Insetting - Make Up Of Insetted Work. Inserting.

UNIT-III

Securing Methods:

Wire Stitching - Saddle Stitching, Side Stitching, Stabbing. 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. -Stages In Sheet Fed, Stages In Reel Fed, Case Making, Stages in casing-in. Ring Binding - Inter Screw, Ring Metal - Types, Loose Leaf Ring Binding. Ring Shapes. Burst Binding, On Demand Booklet Binding. Preflight In The Bindery. Publishers Binding. Magazine Binding & Book 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 M/C. Backing - Backing M/C. 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, Drilling. Label Puching, Appliqué. Edge Decoration - Requirement, Colouring The Edges, Marbling Edges, Edge Gilding. Round Corner Cutting.

Numbering

Folio Numbering, Double Numbering, Duplicate Numbering. Principle of Rotary Numbering. Skip Numbering, Automatic Numbering.

Kindes of Indexes. Ruling - Principle of Pen & Disk Ruling, M.C. Ruling Terms. Banding & Lacing, Poly Bagging, Mailing, Creasing, Bundling, Tacketing. Ultra Violet Curing & Infra Red Curing.

Binding & Finishing Machines:

Study of Various Modern Machines. Modern Guillotines - Single Knife Guillotines. Three Knife Trimmers. Knife Grinding M/C. Gold Blocking/Foil Stamping M/C. Wire Stitching M/C. Straw Board Cutter. Laminating M/C - Small Laminating M/C. Pouch Laminating M/C. Tunnel Laminating M/C. Tipping M/C. Smashing M/C. Back Gluing M/C. Roller Gliding M/C. Inline Rounding M/C. Lining M/C. Modern Lining M/C. Cloth Cutting M/C. Foil Blocking M/C. Rotary Blocking M/ C. Casing In M/C. Case Making M/C. Box Waste Disposal Process. Box & Carton Manufacturing Process. Adhesive binding machine.

Recommended Books :-

Binding And Finishing - Ralph Lyman Binding And Finishing Part-1 - B.D.Mendiratta
Binding Finishing Mailing - T.J.Tedesco Introduction to Printing & Finishing - Hugh Speirs
Finishing Process in Printing - A.G.Martin.

QUALITY CONTROL IN PRINTING AND PACKAGING**Time : 3 hours****Max. Marks: 100**
(25+75)

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

UNIT-I**Introduction**

Definition of Quality, Quality control, its meaning and purpose setting up a Quality Control Programme, and establishing necessary System and procedures, economic consideration.

UNIT-II**Management Consideration**

Quality Control as an attitude and management tool, management's responsibility, organization and personnel functions, getting everybody involved. Total Quality Control. Quality Control procedures and methods. Different shapes of quality control.

UNIT-III**Materials Control**

Establishing clear specifications and standardization of materials to be purchased - particularly paper, ink, plates, blankets and rollers, Inspection and testing of incoming materials as part of quality control; importance of proper handling and maintaining records of performance of materials Sampling and sampling plans.

Establishing Quality control programme in different departments of Printing organization.

UNIT-IV**Quality Control Instrumentation**

Paper and paper board testing instruments for testing printability, print quality and end-use requirements, Ink testing instruments for testing optical and working properties and end-use requirements Process control instruments, devices and aids used in the galley and dark-room, striping department, plate room and press room for specific processes and for general purposes Press sheet control devices used for production of multicolor 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.

6. Introduction to ISO:9000 and ISO:14000 series.

Recommended Books:

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

711
GRAVURE TECHNOLOGY LAB.

Time: 3 Hours

Max. Marks: 75

(25+50)

LIST OF EXPERIMENTS

1. Study of various Gravure printing machine configurations.
2. Study of various components of a Gravure printing machine.
3. Pre-make ready in Gravure Printing Process.
4. Plate preparation/ Cylinder preparation.
5. Make-ready in Gravure Printing Process.
6. Study of feeding unit of a Sheet-fed/ Web-fed Gravure printing machine.
7. Single and Multi colour printing by using Gravure Printing Process.
8. Printing on different substrates by using Gravure Printing Process.
9. Study of delivery unit of a Sheet-fed/ Web-fed Gravure printing machine.
10. Cylinder setting in a Gravure printing machine.
11. Check the practical problems in a Gravure printing process.

712
PRINTING INK TECHNOLOGY LAB

Time: 3 Hours

Max. Marks: 75

(25+50)

LIST OF EXPERIMENTS

1. Various samples of INK and their study.
2. Different samples of Inks and their study.
3. Light fastness test.
4. Study of various component of ink.
5. Effect of Humidity and Temperature on INK.
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.
10. Consumables and miscellaneous used in printing.

713

PRINT FINISHING LAB

Time: 3 Hours

Max. Marks: 75

(25+50)

LIST OF EXPERIMENTS

I. Preparation of the following types of books.

1. Quarter bound a/c books by - French sewing method, Tape sewing method, Cord sewing method, Saddle sewing method, Side sewing method, Whip sewing method.
2. Half bound a/c books by - French sewing method, Tape sewing method, Cord sewing method, Saddle sewing method, Side sewing method, Whip sewing method.
3. Full bound a/c books by - French sewing method, Tape sewing method, Cord sewing method, Saddle sewing method, Side sewing method, Whip sewing method.
4. Preparation of Writing board.
5. Preparation of Photo Album.
6. Preparation of Receipt books with numbers in duplicate & triplicate.
7. Preparation of Cheque books with 25 leaves.
- 8.. Preparation of following type of Mechanical binding - Spiral wire binding, Wire 'O' binding, Ring binding.
9. Preparation of files of following designs - Loose leaf file - single piece, Loose leaf file - Two piece tab binder, Loose leaf guard file - Boards joined with spine strip, Court case file, Portfolio - Closed file to keep confidential loose sheets.
10. Preparation of these types of End papers - Single End paper, Double or Inserted End paper, Made end paper, Cloth joint end paper, Zig Zag end paper, Cloth joint Zig Zag end paper.
11. Preparation of telephone directory with Indexes and Tabs.
12. 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.

714

QUALITY CONTROL IN PRINTING AND PACKAGING LAB.

Time: 3 Hours

Max. Marks: 75

(25+50)

LIST OF EXPERIMENTS

1. Paper testing checking grain direction.
2. Tensile strength of paper, burst strength of paper.
3. Substance, caliper, porosity test, cob sizing value test.
4. Tearing testing of paper, brightness test of paper.
5. Operating test, gloss test, lighting color filter sensor.
6. G.S.M. testing, folding endurance.
7. Moisture contents test, ash contents test.
8. Hot air oven tester, absorbing test.
9. Pick strength, humidity control test, room temp testing.
10. Ink film thickness test.
11. Investigation of pigment properties.
12. Investigation of solvent properties.
13. Measurement of viscosity, tack measurement.
14. Test a printed sheet - proof printing and measurement of colour using spectro photometer, resistance testing of prints.
15. Measurement of ink film thickness.

770

MINOR-PROJECT

MAX. MARKS: 50

Student has to submit a project report on a assigned work by his/her concerned teacher & the report will be evaluate by the examiner appointed by Director/Chairperson