

SHIVAJI UNIVERSITY KOLHAPUR



Syllabus

For

Bachelor of Vocation

in

Printing and publishing

3rd Year Sem – V and VI

Bachelor of Vocation in Printing & Publishing

To be implemented from Academic Year 2017-2018 onwards

BACHELOR OF VOCATION (B.Voc.)

1. Medium of Instruction:

The medium of instruction of the course will be Marathi/ English.

Theory Examination will be conducted strictly in English

2. Pattern: Semester Pattern.

3. Examination:

A. Scheme of examination:

- The semester examination will be conducted at the end of each term (both theory and practical examination)
- Theory paper will be of 50 marks each. There are four practical papers for each semester having 50 Marks each so total 200 marks for practical and 50 marks for seminar/training/project according to each semester curriculum.
- Question papers will be set in the view of the entire syllabus and preferably covering each unit of the syllabus. For each semester there will be four theory papers. Practical Examination will be conducted at the end of every semester.

Paper No.	Title of Paper	Total Marks
PP17	Flexography printing	50
PP18	Gravure Printing	50
PP19	Print Publishing	50
PP 20	Costing & Estimating	50
	Total -	200

Paper No.	Title of Paper	Total Marks
PP 21	Printing Management & Machine Maintainance	50
PP 22	Electronic Colour Separation	50
PP 23	Packaging Technology	50
PP 24	Security Printing	50
	Total -	200

The practical examination will be of 200 marks.

The total weight age of first term is of 400 marks, the details of which are-

Sr. No.	Title	Marks
1	Theory Examination 50 X 4	200
2	Practical Examination.	200
3	Seminar/Projects/ Industry Training	50
	TOTAL	450

Sr. No.	Practical examination	Marks	Internal Assessment	Marks
1	Practical	25	Seminar/Projects/ Industry Training.	50
2	Journal	10		
3	Oral	15		
Total		50		50

B. Nature of question paper:

For the **papers II to V** there will be in all **SEVEN** questions in each paper of which any **FIVE** should be solved. All questions will carry equal marks i.e. each question will be of 10 marks.

General nature of the question paper will be:

Question Number	Type	
Q.1	Short answer	Any two out of three
Q.2,3,4,5,6	Long answer	No internal options.
Q.7	Short notes	Any two out of three

C. Standard of Passing:

To pass the examination a candidate must obtain at least 35% (i.e 18 marks out of 50) in individual subjects, in internal assessment and University examination each in all theory and practical subjects.

Theory Curriculum
B. Voc. Part-III (Degree)

Semester V				Semester VI			
Theory				Theory			
Paper No.	Subject/papers	Credits	Evaluation End Semester exam	Paper No.	Subject / papers	Credits	Evaluation End semester exam
PP17	Flexography printing	3	50	PP 21	Printing Management & Machine Maintainance	3	50
PP18	Gravure Printing	3	50	PP 22	Electronic Colour Seperation	3	50
PP19	Print Publishing	3	50	PP 23	Packaging Technology	3	50
PP 20	Costing & Estimating	3	50	PP 24	Security Printing	3	50
Practical				Practical			
Paper No.	Subject/papers	Credits	Evaluation End Semester exam	Paper No.	Subject / papers	Credits	Evaluation End semester exam
PR17	Flexography printing	4	50	PR 20	Electronic Colour Seperation	4	50
PR18	Gravure Printing	4	50	PR 21	Packaging Technology	4	50
PR19	E-Publishing	4	50	PR 22	Security Printing	4	50
PROJ. 3	Project Stage - I	6	100	PROJ. 4	Project Stage - II	6	100
Total		18	250	Total		18	250

PP17 FLEXOGRAPHY PRINTING

OBJECTIVE:

To introduce the basic principles of flexographic printing process, plate preparation & mounting methods, parts of a flexographic press and maintenance & quality control in flexo press.

UNIT I INTRODUCTION

Flexography – Basic principle, advantages, limitations, applications; Design considerations, screen angles, ink, substrates; Press types – stack, CI, inline, narrow web, wide web; Variations of press – coating, lamination, corrugated postprinting; environment & safety aspects

UNIT II IMAGE CARRIER PREPARATION

Moulded rubber plates; Photopolymer plates – Sheet photopolymer, liquid photopolymer, Direct Imaged Plates, Plate considerations – plate handling, storage, wrap distortion, Ink & solvent compatibility, quality.

UNIT III MOUNTING AND PROOFING

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

UNIT IV PRINTING PRESS

Printing station – fountain rollers, anilox rollers, doctor blades, plate cylinders, impression rollers; Roll mechanics, unwind equipment, infeed, substrate treatment, web tension control, web guiding, inking systems, drying systems, cooling rolls, rewind equipment, web viewers, automatic viscosity controls

UNIT V QUALITY CONTROL

Pressroom Practices, Press Characterization, Flexo QC targets, press optimization Troubleshooting, Case studies.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Frederick R.Boyle, “The Flexo Environment”, Foundation of Flexographic Technical Association, 2002.
2. Anthony White, “High Quality Flexography”, Pira reviews of Printing, Pira International, 1992.
3. Donna C.Mulvihill, “Flexography Primer”, GATF Press, 1991.
4. Helmut Kiphhan, “Handbook of Print Media”, Springer Verlag, 2001
5. J.Michael Adams David, Fauz, Llyod, J.Rieber, “Printing Technology”, 3rd Edition, Delmar Publishers, 1988

List of Practicals

1. Introduction and familiarizing flexo machine and other related elements.
2. Preparation of rubber plates.
3. Preparation of i.liquid photo polymer plates, ii.sheet photo polymer plates.
4. Registering and plate mounting on flexo plate cylinder.
5. Make ready procedures a flexo machine.
6. Printing i.single color, ii.two color, iii.four color.
7. Studying of 6 color and 8 color flexomachines.
8. Printing a various substrates i.LDPE, ii.HPDE, iii.Paper, iv.Aluminium foil.
9. Studying modern flexo machines with inline operations.

PP18 GRAVURE PRINTING

OBJECTIVE:

To impart knowledge on

1. The basic principles of Gravure printing process, cylinder preparation techniques & components of gravure printing unit.
2. Print problems & quality control in Gravure printing process

UNIT I INTRODUCTION

History of gravure, Gravure products and markets - Publication gravure - gravure packaging and converting - product gravure. Gravure Screens.

UNIT II GRAVURE PROCESS AND IMAGE CARRIER PREPARATION

Process characteristics, cylinder construction – design, balancing, copper plating and polishing; reuse of cylinder; well formation; film positives; cylinder layout and film assembly; cross line screen, image carrier preparation techniques – diffusion etch process, direct transfer process, electromechanical, laser and electron beam engraving process.

UNIT III GRAVURE PRINTING MACHINE

Doctor blade assembly – conventional, reverse angle, holder, loading, doctor and back-up blades; scillation, positioning; impression rollers – types, loading, deflection; electrostatic assist impression system; inking system – types; dryer – types; Press design – types; in feed and out feed coating; lamination, inline solvent less lamination; inline converting operations; power transmission system.

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.

TEXT BOOKS:

1. “Gravure: Process and Technology”, Gravure Education Foundation, 2003
2. Kaj Johansson, Peter Lundberg, Robert Ruberg, “A Guide to Graphic Print Production”, Wiley, 2002

REFERENCE BOOKS:

1. Harry B. Smith, “Modern Gravure Technology”, Pira reviews of Printing, Pira International, 1994
2. Samuel B. Hoff, “Screen Printing – A Contemporary Approach”, Delmar Publishers, 1997.
3. Ingram, Samuel, “Screen Printing Primer”, GATF press, 2nd Edition, 1999.
4. William Appleton, “Screen Printing”, PIRA International, 1994.
5. NIIR Board, “Screen Printing Technology Handbook”, Asia Pacific Business Press Inc., 2004

List of Practicals

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.

UNIT-I INTRODUCTION

Introduction to Publishing Technology – Meaning, Concept, Scope and Importance

UNIT-II KINDS OF PUBLICATIONS:

Kinds of Publications:

1. Books for Children, dictionary
2. Scientific Technical and Medical Books
3. Textbooks, Journals and Manuals
4. Newspapers and Magazines

UNIT –III PROCESS OF PUBLISHING

Process of Publishing

1. Meaning and concept of Manuscripts, CRCs, and Typesetting
2. Concept of Proof Reading in composed pages, content vetting, editing
3. Parts in a book
4. Pre-press activities
5. Production and Emerging Technologies in Publishing
6. An overview different binding techniques for publications along with Lamination

UNIT -IV COST ESTIMATING

1. Costing and estimation for publications
2. Marketing Promotion and Distribution of published books

UNIT –V QUALITY STANDARD

1. Govt. certifications and Licenses required for bringing publications- As Police and RNI Authorities
2. Copy Right Act, IPR
3. Quality Standard for Publications – Bar-coding and ISBN etc.

UNIT-VI E-PUBLISHING

1. e-Publishing – Concept and importance in today’s world
2. Technical requirements for e-publishing
3. Role of Internet

RECOMMENDED BOOKS

1. Offset press operating; GATF USA published by Graphic Arts Technical Fndtn Publication, USA
2. Faux 1; Lithography GATF USA. published by Graphic Arts Technical Fndtn Publication, USA
3. Lithographer’s manual GATF USA. published by Graphic Arts Technical Fndtn Publication, USA
4. Machines Printing by Durraut W.R., Focal Press London.
5. Technology of offset Printing by C.S. Mishra; Anupam Prakashan Allahabad.

List of Practicals

1. Publishing of a newsletter for institute
2. Publishing of a Books and Journal (Small)
3. Editing of books, journals and newsletters
4. Publishing of downloaded notes of Printing Concepts in form of books

OBJECTIVE:

To impart knowledge on

1. Basic concepts of costing, pricing, estimating and investment analysis
2. Estimating cost of printing materials and different processes for various print jobs

UNIT I INTRODUCTION

Brief introduction to Indian and Federation costing system. Importance of costing and estimating in printing and publishing trade, definition of cost, price and profit.

UNIT II COSTING AND PRICING

Costing systems - cost; profit; price; functions of costing; costing models; types of costing – marginal costing, job costing, budgeting costing; types of budgets; budgetary control; sales forecasts and budgets for printing and allied industries; relationship between cost control and budgetary control.

UNIT III ESTIMATING

Cost estimating, price estimating, estimator needs; procedure for selling, estimating, pricing and quoting for printing; estimating methods; production planning; computerized estimating.

UNIT IV ESTIMATING PRINTING MATERIALS FOR PROCESSES

Paper- sheet and web; ink; toners; pre-press; machine printing – sheet-fed offset, web offset, flexography, gravure, screen printing, digital printing; post press; e-publishing.

UNIT V COST ANALYSIS

Classification of cost; elements of cost; costing of direct materials; costing of machine operations; costing of manual operations; costing – typesetting, scanning, plate-making, printing, binding and finishing operations.

UNIT VI INVESTMENT ANALYSIS

Time value of money, compound value, present value, annuities, pay back method, average rate of return and internal rate of return method; Depreciation, Return on Investment, Return On Capital Expenditure; Break even analysis – analysis, calculation of break even point, margin of safety, sensitivity analysis and profit graphs, Basics of Credit Management – AR, AP.

TEXT BOOKS:

1. Hugh Speirs, "Print Estimator's Handbook", 2nd edition, Pira International Ltd., 2004
2. Prasanna Chandra, Financial Management, Theory and Practice, Tata McGraw Hill, New Delhi, 6th Ed. 2004.

REFERENCE BOOKS:

1. "Cost Accounting for Printers", Part I and Part II, British Printing Industries
2. Federation, 1982
3. K. S. Venkataraman and K. S. Balaraman, "Estimating Methods and Cost Analysis for Printers", Ramya Features and Publications, 1987
4. Dipl.-Ing. B. D. Mendiratta, "Printer's Costing and Estimating", Printing India Publications Pvt. Ltd., 1999.
5. Hugh M. Speirs, "Print Estimators – The Handbook", BPIF, 1996. 86
6. N. D. Vohra, "Quantitative Techniques in Management", Tata McGraw Hill
7. Publishing Company Limited, 1990
8. James C. Van Hrone & John M. Wachowicz Ja, Fundamentals of Financial management, Prentice Hall India Pvt. Ltd., Eastern Economy Edition, New Delhi 2004, 11th Edition.

RECOMMENDED BOOKS

1. Printer's Costing and estimating by B.D. Mendiratta; Printrade India Publications Pvt. Ltd., New Delhi.
2. Costing for the smaller Printing Business, BPIF, and London.
3. Estimating for Printers, BPIF, and London. published by Orion *Publishing* Group, London
4. Printing Estimating Principles and practice by Philip Kent Rugged, California Polytechnic State University.

UNIT I

Business Environment – Printing industry in India. Impact of globalization and IT.

UNIT II

Management – Nature scope and importance of Management, Functions of Management –Scientific, Management, CPM & PERT (Introduction).

UNIT III

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

UNIT IV

Marketing management – Marketing and its functions, distribution channels, salesmanship and advertising

UNIT V

Human resource management: Manpower planning – recruitment, selection, Training performance appraisal Wage and salary administration.

UNIT VI

Financial Management, Nature, Scope objectives and functions of Financial Management.

UNIT VII

Work flow and organizational structure in a printing press.

UNIT VIII

Cost Accounting: Cost concept, cost sheet, B.E.P.analysis, cost reduction and cost control.

UNIT IX

Depreciation - Introduction to different methods and their comparison.

MACHINE MAINTENANCE

OBJECTIVE:

To provide an overview of the printing machinery maintenance and maintenance management.

UNIT X MAINTENANCE MANAGEMENT PERSPECTIVE

Objectives and functions, Problems and challenges, Organisation, Maintenance methods, Criticality determination, Categorization, Economic aspects of maintenance. Emerging trends.

UNIT XI TOTAL PLANNED MAINTENANCE

System components, documentation, facility register, records, safety related issues. Spare

parts management. Maintenance schedules and control system. Inspection and lubrication, purpose, lubricants, lubricating systems.

UNIT XII TOTAL PRODUCTIVE MAINTENANCE

Six big losses, measuring the losses. Evaluating equipment effectiveness. Prepress maintenance, Press maintenance, Printing and allied equipment maintenance. Electrical components maintenance: Motors, Electric brakes. Mechanical components maintenance: Bearings, Clutches, Drives.

UNIT XIII ERECTION AND TESTING

Foundation requirements, Condition based maintenance: Condition monitoring, Techniques, Vibration analysis, Thermography, Non destructive testing methods and diagnostic instruments.

UNIT XIV RECONDITIONING AND REPLACEMENT THEORY

Repairs and reconditioning methods for various parts, roller copperising, re-rubberizing. Replacement models - Replacement policy, replacement of items, Determination of average life.

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.
 - (1.) Maintenance Engineering Handbook
 - (2.) Lindley R. Higgings, Mc Graw Hill International Edition.
 - (3.) Operator’s Manually by GATF.
6. H.P.Garg, “Industrial Maintenance”, S.Chand & Company Ltd., 1990.
7. Kenneth E.Rizzo, “Total Production Management”, Second Edn., GATF Press.
8. N.D.Vohra, “Quantitative Techniques in Management”, Tata McGraw – Hill Publishing Co. Ltd.
9. Herschell L. Apfelberg, “Maintaining Printing Equipment”, GATF Press.
10. Lidley R.Higgins.P.E., L.C.Morrow, “Maintenance Engineering”, Handbook, McGraw – Hill Publishing Co. Ltd.
11. R.D. Aggarwal-Organisation and Management-Tata McGraw Hill Publishing Ltd., New Delhi

TEXT BOOK

1. Venkataraman.K, “Maintenance Engineering and Management”, Printice-Hall of India Private Limited., 2007.
2. P.Goplakrishnan, A.K.Banerji, “Maintenance and Spare Parts Management”, Printice- Hall of India, 1977.

UNIT I INTRODUCTION TO COLOUR

Basic colour theory, additive and subtractive colours, process colours, application of the colour theory to colour reproduction. Overview of colour reproduction from original to printing.

UNIT II CHOOSING A TRANSPARENCY FOR REPRODUCTION

Exposure level, colour balance, memory colours; grainers, contrast; highlight retouched original transparency, evaluation the transparency.

UNIT III COLOUR REPRODUCTION

Essential requirements of cameras, lens, illuminations filters and half tone screen for colour reproduction work Tone and colour controls Gray scale and colour control patches the ink/paper/colour interaction Measurement and control of colour printing Using the densitometers.

UNIT IV COLOUR SEPARATING METHODS

Basic principles of colour separation Direct separation method and Indirect colour separation method, procedure followed for each method Methods and procedures followed for making the black printer negative for the indirect method, for making continuous tone positives and the making of final screened negatives and positives establishing a colour reproduction procedure.

UNIT V COLOUR CORRECTION

Objectives of colour correction ; Hand correction, Purposes and procedure followed; retouching techniques; correcting colours, tones and shades given inks and paper. Dot etching, purposes and procedure, flat etching, staging and etching, local reduction, blending; Masking; purposes of masking types of maskings; their clarification and uses; Electronic colour separation and correction.

UNIT VI COLOUR PROOFING

Press proofing methods and various pre-press proofing systems; uses and limitations of prepress sheet Interpreting pre press proofs and predicting, press results Control devices for proofing systems.

UNIT VII PLANNING FOR COLOUR WORK

8. Introduction & Working of image capturing techniques of Drum, Flat Bed Scanners & Image Setters.

REFERENCE BOOKS

1. Dr. R.W.G. Hont :- The reproduction of colour. Fountain Press, 4th edition.
2. Miles Southworth & Donna Southworth :- Colour Reproduction. Graphic Arts Publishing, 3.1 edition.
3. Gary G. Field :- Tone & Colour correction (GATF).

List of Practicals

1. Making of Half tone negative using process camera.
2. Making of own colour control patches.
3. Gray Scale (Drawing).
4. Drawings spectrophotometer curve by using spectro densitometer.
5. How to make colour separation negative of a four colored original by using Electronic colour separation system.
(Scanning).
6. Working of Image Setter and obtaining output on Image Setter.
7. Colour Correction by using photography masking.
8. Six Colour Wheel.
9. Planning for four Colour Newspapers designs.
10. Software for colour separation Photoshop, CorelDraw, quark express.
11. Preparation of originals for separation - reflection type and transparency.
12. Demonstration of various masking methods using reflection copy, by OHP/ Slides, video etc.
13. Exposing tonal correction mask, making UCR mask/GCR mask etc.
14. Comparison of camera separation and scanned separation.
15. Cut out and mixing jobs.
16. Use of different Quality Control Aids. New developments in Electronic Imposition & DTP etc.

PP23 PACKAGING TECHNOLOGY-I

UNIT – I

- 1.1 Definition and function of Packaging
- 1.2 Packaging criteria and packaging development
- 1.3 Product properties influencing packaging development
- 1.4 Shelf life of product and packaging material
- 1.5 Types of packaging material and printing techniques for different materials
- 1.6 Theory on testing's available for paper and their significance

UNIT - II

- 2.1 Definition and History of paper
- 2.2 Defects of paper and their detections
- 2.3 Manufacturing processes for paper and board
- 2.4 Application of paper in packaging
- 2.5 Types of paper and their selection criteria

UNIT- III

- 3.1 Definition and types of folding board cartons
- 3.2 Relevant properties of paper board for carton
- 3.3 Manufacturing process and flow chart for carton
- 3.4 Type of laminations and special effects for ornamentation available in market
- 3.5 Definition of Composite containers and its application
- 3.6 Types of composite containers and their manufacturing process

UNIT – IV

- 4.1 Definition and types of CFB's
- 4.2 Board construction – Liners and Flutes
- 4.3 Manufacturing Joints, Coatings, Design and flute selection
- 4.4 Box style and their economics
- 4.5 Manufacturing process with diagrams
- 4.6 Advantages and limitations

REFERENCES BOOKS:

[R1] Modern Food Packaging – By Indian Institute of Packaging

[R2] Packaging Technology Educational Volume – 1 – By Indian Institute of Packaging

[R3] Packaging Technology Educational Volume – 2 – By Indian Institute of Packaging 52

Scheme and Syllabi for B. Voc. (Printing Technology), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31st July, 2015.

List of practicals:

1. Thickness of paper
2. Compression Strength
3. Edge crush test
4. Flat crush test
5. Bulk density of paper
6. Ash content
7. Stiffness
8. Moisture content
9. Tensile Strength
10. Bursting Strength
11. Tearing resistance
12. Folding Endurance
13. Cobb Test

PP24 SECURITY PRINTING

OBJECTIVE

- To get an understanding of various security features, materials and methods involved in Security Printing.
- To know the appropriate Printing Techniques for different applications.

UNIT I INTRODUCTION

Need for Security printing – special issues, counterfeiting -Creation & Graphics, Making of a bank note, Circulation & Bank maintenance- RBI specifications- General security aspects of currencies- Importance of Academic and industrial security- types of products – Suitable Printing techniques for various applications

UNIT II INKS

Types of security printing inks, features - metal revealable, migrating, heat reactive, erasable, fugitive, copy-protection, thermal chromic, coin reactive, bleeding, pen reactive, irreversible, visible infrared, penetrating, chemical reactive and optically variable ink (OVI) Introduction, UV Curing, Photo chromic inks, Monochromic Inks, Invisible Phosphorescent inks, Water Resistant Inks.

UNIT III SECURITY SUBSTRATES

Security Fibres, Planchettes, Fluorescent Hilites, Iridescent coating, Security threads, Holographic foil, Colour centred paper, Chemical reactive, chemically void, toner fused paper, visible security fibers, invisible fluorescent fibers and other security papers.

UNIT IV SECURITY PRINTING TECHNOLOGY

Water marking – Digital Watermark -Holograms - UV-visible Printing, rainbow printing, micro lines, guilloches, numbering, Line-printing, stamp embossing, hot-foil-embossing, embossing / punching, customer - designed hologram, blind red printing, solvent colors, multi color Uvfluorescence stitching thread, holographic foil or lamination of a page, Principles of Bar coding, Types of Coding EAN 13 Code, Code 39 ACA etc

UNIT V APPLICATIONS

Security design and processes for various print products: Barcodes, Holograms, cheque printing- MICR cheques and Reserve Bank of India (RBI) specifications, finishing, paper specifications- Manufacturing process of – Bank Notes – Business forms – Certificates- Passports – Packaging - Card printing. Different types of machines used for producing various security products. Recent trends and developments in security printing.

TEXT BOOKS:

1. Martin Monestics, “The Art of Paper Currency”, Quarlet Books Ltd.,1983.
2. Leibigner, “Numbering Machines & Systems”, Company Leibigner Numbering Systems.

REFERENCE BOOKS :

1. EIRI Board of Consultants and Engineers “Hand Book of Printing Technology” Engineers India Research Institute, New Delhi
2. Indian Institute of Bankers (1999) “Bank Credit Card Business” Macmillan, Delhi
3. William H. Erdei, “Barcode - Design, Printing & Quality Control”, McGraw Hill Inc., 1998.
4. R. Narayanan, “Computer Stationery & MICR – Cheque Production” Association for Research & Development in Printing, 1998.

List of Practicals

1. To study inks used in security Printing
2. To study substrates used in security Printing
3. Study about Barcode scanning, security thread, holograms and microprinting
4. Study about serial numbering anticopying marks copy evident and MICR cheques
5. Study about RFID device